12.3.3.5 Alternative 2A—Dual Conveyance with Pipeline/Tunnel and Five Intakes (15,000 cfs; Operational Scenario B)

Alternative 2A, which is described in Section 3.5.5 in Chapter 3, *Description of Alternatives*, and depicted in Figure 3-2, would affect terrestrial biological resources in a nearly identical fashion to Alternative 1A. The principal differences would be related to the differing construction footprints of the water conveyance facilities (CM1). The Alternative 2A water conveyance facilities could entail construction at north Delta Intakes 6 and 7 rather than 4 and 5. The locations of these intakes are depicted in Figure 3-2. Intakes 6 and 7 are located farther south on the Sacramento River, south of Sutter and Steamboat Sloughs. The operational scenario for Alternative 2A (Scenario B) is also different from Alternative 1A (Scenario A), but water operations would not significantly affect terrestrial biological resources in the study area. Alternative 2A operations would involve placement of a permanent in-stream operable barrier at the head of Old River in the south Delta and increased Delta freshwater outflows during September through November of some water years. All of the conservation measures other than CM1 would be the same as under Alternative 1A.

Due to the change in location of the two intakes and their associated pumps and pipelines, Alternative 2A would create minor differences in the permanent and temporary loss of natural communities and cultivated lands during water conveyance facilities construction when compared with Alternative 1A (Table 12-2A-1). All of these differences would occur during the near-term timeframe associated with water facilities construction. Alternative 2A would permanently remove 4 fewer acres of valley/foothill riparian habitat along the Sacramento River, and 7 acres more of grassland in the same area. Alternative 2A would also permanently affect a larger acreage of potential jurisdictional wetlands as regulated by Section 404 of the CWA, when compared to Alternative 1A (1 acre more).

During the water conveyance facilities construction process, Alternative 2A would involve slightly more temporary loss of habitat when compared with Alternative 1A because of the lengthy pipelines needed to serve Intakes 6 and 7. The differences would include cultivated lands east of the river (413 acres more), tidal perennial aquatic within the river channel (7 acres more), valley/foothill riparian along the river levee(4 acres more), and grassland along the river levee (9 acres more; see Table 12-2A-1). Alternative 2A would also temporarily affect a larger acreage of potential jurisdictional wetlands as regulated by Section 404 of the CWA, when compared to Alternative 1A (19 acres more).

Note that the acres of habitat affected by CM1, as listed in Table 12-2A-1, would be acres affected in the near-term timeframe, or the first 10 years of Plan implementation. The acres represented in Table 12-2A-2 for the late long-term timeframe are acres affected cumulatively over the entire 50-year period of the Plan.

Table 12-2A-1. Alternative 2A Near-Term Effects of Water Conveyance Facilities (CM1) on Natural Communities (acres)

Natural Community	Total Existing Habitat in Study Area	Conveyance Option			
		Alternative 2A Removed Habitat (Permanent)[b]	Difference from Alternative 1A	Alternative 2A Removed Habitat (Temporary)[c]	Difference from Alternative 1A
Tidal perennial aquatic[a]	86,266	48	0	140	+7
Tidal brackish emergent wetland	8,501	0	0	0	0
Tidal freshwater emergent wetland	8,953	6	0	5	-1
Valley/foothill riparian	18,449	55	-4	32	+4
Nontidal perennial aquatic	5,587	12	0	9	0
Nontidal freshwater perennial emergent wetland	1,369	1	0	1	0
Alkali seasonal wetland complex	3,723	0	0	0	0
Vernal pool complex	9,395	0	0	0	0
Managed wetland	64,966	3	0	8	0
Other natural seasonal wetland	842	0	0	0	0
Grassland	80,355	325	+7	271	+9
Inland dune scrub	20	0	0	0	0
Cultivated land	511,832	3,489	-26	2,365	+413

[a] Tidal mudflat has been included in the tidal perennial aquatic natural community.

[b] Features in this category include the following conveyance-related facilities: Forebay, Afterbay, Intake Facilities, Pump Stations, Permanent Access Roads, Shaft Locations, Muck Disposal Areas and Borrow/Spoil Areas.

[c] Features in this category include the following conveyance features: Barge Unloading Facility, Control Structure Work Area, Intake Road Work Area, Intake Work Area, Pipeline, Pipeline Work Area, Road Work Area, Safe Haven Work Area, Temporary Access Road Work Area, Tunnel Work Area.

These mostly minor differences in loss of habitat would create minor differences in effects on covered and noncovered wildlife. The small reductions in permanent loss of cropland (primarily alfalfa and irrigated pasture) associated with Alternative 2A would result in a slightly smaller loss of foraging habitat for species such as tricolored blackbird, Swainson's hawk, white-tailed kite, short-eared owl, loggerhead shrike, northern harrier, and California horned lark. There would be a smaller reduction in secondary use areas for greater sandhill crane. Alternative 2A would also reduce the loss of low- and moderate-value habitat for western burrowing owl. The reduced level of valley/foothill riparian habitat loss would be a positive influence on breeding habitat for raptors, herons and egrets (great egret, snowy egret, great blue heron, Swainsons hawk, Cooper's hawk, white-tailed kite and black-crowned night heron), and migratory habitat for species that use the river corridor, such as western yellow-billed cuckoo. The larger temporary losses of cultivated land, grassland and valley/foothill riparian natural communities would have near-term effects on the special-status species that use these communities, but the effects would be offset over time by on-site restoration required by *AMM10 Restoration of Temporarily Affected Natural Communities*.

The differences in effect that Alternatives 1A and 2A could have on special-status plant species are extremely minor. Habitat modeling indicates that Alternative 1A would create 1 more acre of permanent loss of side-flowering skullcap habitat and temporary removal of 1 more acre of Mason's lilaeopsis and delta mudwort habitat, when compared with Alternative 2A.

The reader is referred to the Alternative 1A impact analysis above for the broader discussion of overall terrestrial biological resources effects that would result from implementation of Alternative 2A. The principal effects of concern associated with both Alternative 1A and 2A are related to the conversion of large acreages of cultivated lands and managed wetland to tidal and other natural communities (Table 12-2A-2). These effects accrue to special-status species and common wildlife species that rely on cultivated lands and managed wetlands during some life stage. Foraging raptors and some waterbirds are regular inhabitants of the Delta's cultivated lands. The Delta's managed wetlands provide freshwater nesting, feeding and resting habitat for a large number of Pacific flyway waterfowl and shorebirds, as well as nesting passerines, such as tricolored blackbird. Special-status plant species that occupy the tidal fringe in Suisun Marsh and parts of the Delta would be subject to losses associated with physical construction activity (levee breaching and reconstruction) and changes in water depth and salinity in their current habitat as a result of tidal marsh restoration.

Table 12-2A-2. Alternative 2A Late Long-term Effects of Restoration Activities (CM2, CM4, CM5) on Natural Communities (acres)

Natural Community	Conservation Measure					
	CM2[b]		CM4[c]		CM5[d]	
	Permanent[e]	Temporary[f]	Permanent[e]	Temporary[f]	Permanent[e]	Temporary[f]
Tidal perennial aquatic[a]	8	12	58	0	2	5
Tidal brackish emergent wetland	0	0	Unk.	0	0	0
Tidal freshwater emergent wetland	6	0	3	0	1	1
Valley/foothill riparian	229	149	552	0	43	35
Nontidal perennial aquatic	34	10	189	0	28	16
Nontidal freshwater perennial	0	1	97	0	0	0

emergent wetland						
Alkali seasonal wetland complex	45	0	27	0	0	0
Vernal pool complex	0	0	1	0	0	0
Managed wetland	24	42	12,786	0	0	0
Other natural seasonal wetland	0	0	0	0	0	0
Grassland	261	165	1,495	0	449	32
Inland dune scrub	0	0	0	0	0	0
Cultivated land	540	1	35,515	0	4,979	1,085

[a] Tidal mudflat has been included in the tidal perennial aquatic natural community.
[b] Yolo Bypass Fisheries Enhancement
[c] Tidal Natural Communities Restoration
[d] Seasonally Inundated Floodplain Restoration
[e] Features in this category include the following conveyance-related facilities: Forebay, Afterbay, Intake Facilities, Pump Stations, Permanent Access Roads, Shaft Locations, Muck Disposal Areas and Borrow/Spoil Areas.
[f] Features in this category include the following conveyance features: Barge Unloading Facility, Control Structure Work Area, Intake Road Work Area, Intake Work Area, Pipeline, Pipeline Work Area, Road Work Area, Safe Haven Work Area, Temporary Access Road Work Area, Tunnel Work Area.
Unk. = Unknown

Some of the permanent habitat loss associated with these alternatives would occur during the early, construction-related stage of the BDCP. Other losses would occur over time as some habitats (cultivated lands, managed wetland, valley/foothill riparian and grassland) are converted to tidal perennial aquatic, tidal brackish emergent wetland and tidal freshwater emergent wetland natural communities. The BDCP conservation components are designed to eventually replace and expand habitats that would have a positive influence on plant and animal species covered in the Plan. Similar benefits would accrue to noncovered special-status species and common wildlife in the study area.

The near-term conservation activities described and evaluated in Appendix 12D would provide for protection, enhancement and restoration of habitats affected by the near-term water conveyance facilities construction activities. This conservation activity, which is part of the early implementation of the BDCP, would offset water conveyance facilities construction effects on both covered and noncovered special-status species in the study area.

As with Alternative 1A, Alternative 2A would require several mitigation measures to be adopted to reduce all effects on terrestrial biological resources to less-than-significant levels. These mitigation measures would be needed beyond the impact offsets provided by Alternative 2A AMMs and CM2–CM22 conservation actions. The relevant mitigation measures, which are included in detail in the analysis of Alternative 1A, are as follows:

- Mitigation Measure BIO-42: Avoid impacts on delta green ground beetle and its habitat
- Mitigation Measure BIO-43: Avoid and minimize loss of Callippe silverspot butterfly habitat
- Mitigation Measure BIO-55: Conduct preconstruction surveys for noncovered special-status reptiles and implement applicable CM22 measures
- Mitigation Measure BIO-69a: Restore greater sandhill crane roost habitat prior to or within the first two years of project construction

- Mitigation Measure BIO-75: Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds
- Mitigation Measure BIO-91: Compensate for loss of high-value burrowing owl habitat
- Mitigation Measure BIO-117: Compensate for loss of suitable nesting habitat for cormorants, herons and egrets
- Mitigation Measure BIO-121: Near-term conservation of cultivated lands must include sufficient acres of crop types that benefit nesting short-eared owl and northern harrier
- Mitigation Measure BIO-130: Compensate for loss of nesting habitat for grasshopper sparrow
- Mitigation Measure BIO-138: Compensate for loss of high-value loggerhead shrike habitat
- Mitigation Measure BIO-146: Active bank swallow colonies shall be avoided and indirect effects on bank swallow will be minimized
- Mitigation Measure BIO-147: Monitor bank swallow colonies and evaluate winter and spring flows upstream of the Plan Area
- Mitigation Measure BIO-163: Conduct preconstruction survey for American badger
- Mitigation Measure BIO-166: Conduct preconstruction surveys for roosting bats and implement protective measures
- Mitigation Measure BIO-169: Apply *CM22 Avoidance and Minimization Measures* to noncovered special-status plant species
- Mitigation Measure BIO-179a: Conduct food studies and monitoring for wintering waterfowl in Suisun Marsh
- Mitigation Measure BIO-179b: Conduct food studies and monitoring to demonstrate food quality of palustrine tidal wetlands in the Yolo and Delta Basins
- Mitigation Measure BIO-180: Conduct food and monitoring studies of breeding waterfowl in Suisun Marsh
- Mitigation Measure BIO-181: Conduct studies to quantify shorebird food resources in tidal wetlands

12.3.3.6 Alternative 2B—Dual Conveyance with East Alignment and Five Intakes (15,000 cfs; Operational Scenario B)

Alternative 2B, which is described in Section 3.5.6 of Chapter 3, *Description of Alternatives*, and depicted in Figure 3-4, would affect terrestrial biological resources in a similar fashion to Alternative 1B. The principal differences would be related to the differing construction footprints of the water conveyance facilities (CM1). The Alternative 2B water conveyance facilities could entail construction at north Delta Intakes 6 and 7 rather than 4 and 5. The locations of these intakes are depicted in Figure 3-2. Intakes 6 and 7 are located farther south on the Sacramento River, south of Sutter and Steamboat Sloughs. This location change results in longer pipeline construction to move water from the Sacramento River to the East Canal. The operational scenario for Alternative 2B (Scenario B) is also different from Alternative 1B (Scenario A), but water operations would not significantly affect terrestrial biological resources in the study area. Alternative 2B operations would involve placement of a permanent operable barrier at the head of Old River in the south Delta and increased Delta freshwater outflows during September, October and November of some water years. All of the conservation measures other than CM1 would be the same as under Alternative 1B.

Because of the change in location of the two intakes and their associated pumps and pipelines, Alternative 2B would create minor differences in permanent and larger differences in temporary loss of natural communities and cultivated lands during water conveyance facilities construction when compared with Alternative 1B (Table 12-2B-1). All of these differences would occur in the near-term timeframe associated with water facilities construction. Alternative 2B would permanently remove 4 fewer acres of valley/foothill riparian habitat along the Sacramento River and 36 fewer acres of cultivated land (primarily alfalfa and irrigated pasture) just east of the river. When compared with Alternative 1B, Alternative 2B would permanently remove 7 acres more of grassland and 1 acre more of tidal perennial aquatic natural community along the eastern bank of the river at intake sites. Alternative 2B would also permanently affect a larger acreage of potential jurisdictional wetlands as regulated by Section 404 of the CWA, when compared to Alternative 1B (1 acre more).

Table 12-2B-1. Alternative 2B Near-Term Effects of Water Conveyance Facilities (CM1) on Natural Communities (acres)

Natural Community	Total Existing Habitat in Study Area	Conveyance Option			
		Alternative 2B Removed Habitat (Permanent)[b]	Difference from Alternative 1B	Alternative 2B Removed Habitat (Temporary)[c]	Difference from Alternative 1B
Tidal perennial aquatic[a]	86,266	34	+1	171	+26
Tidal brackish emergent wetland	8,501	0	0	0	0
Tidal freshwater emergent wetland	8,953	8	0	16	+5
Valley/foothill riparian	18,449	48	-4	56	+17
Nontidal perennial aquatic	5,587	19	0	5	0
Nontidal freshwater perennial emergent wetland	1,369	5	0	7	+1
Alkali seasonal wetland complex	3,723	0	0	0	0
Vernal pool complex	9,395	0	0	0	0
Managed wetland	64,966	6	0	20	+2
Other natural seasonal wetland	842	0	0	0	0
Grassland	80,355	410	+7	382	+24
Inland dune scrub	20	0	0	0	0
Cultivated land	511,832	6,694	-36	11,994	+419

[a] Tidal mudflat has been included in the tidal perennial aquatic natural community.

[b] Features in this category include the following conveyance-related facilities: Canal, Forebay, Afterbay, Intake Facilities, Pump Stations, Permanent Access Roads, Shaft Locations, Muck Disposal Areas and Borrow/Spoil Areas.

[c] Features in this category include the following conveyance features: Canal Work Area, Barge Unloading Facility, Control Structure Work Area, Intake Road Work Area, Intake Work Area, Pipeline, Pipeline Work Area, Road Work Area, Safe Haven Work Area, Temporary Access Road Work Area, Tunnel Work Area.

During the water conveyance facilities construction process, Alternative 2B would involve significantly more temporary loss of tidal perennial aquatic habitat (26 acres), valley/foothill riparian habitat (17 acres) and grassland (24 acres). These temporary losses would occur primarily along Snodgrass Slough and the north-south irrigation canal just east of the slough. The Alternative 2B pipelines would also temporarily affect greater acreages of cultivated land (419 acres more), including alfalfa, vineyard, orchard and other cultivated cropland. There would be much smaller differences in the acreage of temporary effect on managed wetland and tidal freshwater emergent wetland (Table 12-2B-1). Alternative 2B would also temporarily affect a larger acreage of potential jurisdictional wetlands as regulated by Section 404 of the CWA, when compared to Alternative 1B (48 acres more).

Note that the acres of habitat affected by CM1, as listed in Table 12-2B-1, would be acres affected in the near-term timeframe, or the first 10 years of Plan implementation. The acres represented in Table 12-2B-2 for the late long-term timeframe are acres affected cumulatively over the entire 50-year period of the Plan.

The minor differences in permanent loss of habitat associated with Alternative 2B would create minor differences in effects on covered and noncovered wildlife species. The small reductions in permanent loss of alfalfa and irrigated pasture associated with Alternative 2B would result in a slightly smaller loss of foraging habitat for species such as tricolored blackbird, Swainson's hawk and white-tailed kite. There would be a smaller reduction in secondary use areas for greater sandhill crane. Alternative 2B would also reduce the loss of low- and moderate-value habitat for western burrowing owl. The reduced level of valley/foothill riparian habitat loss would be a positive influence on breeding habitat for raptors and migratory habitat for species that use the river corridor, such as western yellow-billed cuckoo.

The larger acreages of temporary losses of tidal perennial aquatic and tidal freshwater emergent wetland habitat would affect a number of wetland habitat-dependent birds and reptiles, including tricolored blackbird, least bittern, giant garter snake and western pond turtle. Construction across Snodgrass Slough and the adjacent irrigation canal could disrupt both foraging and migration activities of giant garter snake. The temporary losses of valley/foothill riparian habitat would affect roosting and nesting habitat for bird species such as Swainson's hawk, white-tailed kite, great egret, snowy egret, great blue heron, Cooper's hawk, and black-crowned night heron. Temporary losses of grassland between the Sacramento River and the East Canal would reduce foraging habitat for species such as short-eared owl, northern harrier, mountain plover, California horned lark, and greater sandhill crane. Grassland loss would also reduce refugia for giant garter snake. The temporary losses in cultivated acreage, especially alfalfa and other cultivated cropland, would reduce foraging habitat for species such as Swainson's hawk, greater sandhill crane, short-eared owl, mountain plover, and loggerhead shrike.

The differences in effect that Alternatives 1B and 2B could have on special-status plant species are extremely minor. Habitat modeling indicates that Alternative 1B would create 1 more acre of permanent loss of side-flowering skullcap habitat and temporary removal of 1 more acre of Mason's lilaeopsis and delta mudwort habitat, when compared with Alternative 2B.

The reader is referred to the Alternative 1B impact analysis above for the broader discussion of overall terrestrial biological resources effects that would result from implementation of Alternative 2B. The principal effects of concern associated with both Alternatives 1B and 2B are related to the conversion of large acreages of cultivated lands and managed wetland to water conveyance facilities

(CM1), tidal marsh and other habitat types(CM2, CM4, and CM5; Table 12-2B-2). These effects accrue to special-status species and common wildlife species that rely on cultivated lands and managed wetlands during some life stage. Foraging raptors and some waterbirds are regular inhabitants of the Delta's cultivated lands. The Delta's managed wetlands provide freshwater nesting, feeding and resting habitat for a large number of Pacific flyway waterfowl and shorebirds, as well as nesting passerines, such as tricolored blackbird. Special-status plant species that occupy the tidal fringe in Suisun Marsh and parts of the Delta would be subject to losses associated with physical construction activity (levee breaching and reconstruction) and changes in water depth and salinity in their current habitat as a result of tidal marsh restoration.

Table 12-2B-2. Alternative 2B Late Long-Term Effects of Restoration Activities (CM2, CM4, CM5) on Natural Communities (acres)

Natural Community	Conservation Measure					
	CM2[b]		CM4[c]		CM5[d]	
	Permanent[e]	Temporary[f]	Permanent[e]	Temporary[f]	Permanent[e]	Temporary[f]
Tidal perennial aquatic[a]	8	12	58	0	2	5
Tidal brackish emergent wetland	0	0	Unk.	0	0	0
Tidal freshwater emergent wetland	6	0	3	0	1	1
Valley/foothill riparian	229	149	552	0	43	35
Nontidal perennial aquatic	34	10	189	0	28	16
Nontidal freshwater perennial emergent wetland	0	1	97	0	0	0
Alkali seasonal wetland complex	45	0	27	0	0	0
Vernal pool complex	0	0	1	0	0	0
Managed wetland	24	42	12,786	0	0	0
Other natural seasonal wetland	0	0	0	0	0	0
Grassland	261	165	1,495	0	449	32
Inland dune scrub	0	0	0	0	0	0
Cultivated land	540	1	34,653	0	4,979	1,085

[a] Tidal mudflat has been included in the tidal perennial aquatic natural community.
[b] Yolo Bypass Fisheries Enhancement
[c] Tidal Natural Communities Restoration
[d] Seasonally Inundated Floodplain Restoration
[e] Features in this category include the following conveyance-related facilities: Forebay, Afterbay, Intake Facilities, Pump Stations, Permanent Access Roads, Shaft Locations, Muck Disposal Areas and Borrow/Spoil Areas.
[6] Features in this category include the following conveyance features: Barge Unloading Facility, Control Structure Work Area, Intake Road Work Area, Intake Work Area, Pipeline, Pipeline Work Area, Road Work Area, Safe Haven Work Area, Temporary Access Road Work Area, Tunnel Work Area.
Unk. = Unknown

Some of the permanent habitat loss associated with these alternatives would occur during the early, construction-related stage of the BDCP. Other losses would occur over time as some habitats (cultivated lands, managed wetland, valley/foothill riparian and grassland) are converted to tidal marsh (tidal perennial aquatic, tidal freshwater emergent wetland, tidal brackish emergent wetland) and other natural communities. The BDCP conservation components are designed to eventually replace and expand habitats that would have a positive influence on plant and animal species covered in the Plan. These conservation components would also have a positive effect on noncovered and common species that occupy the Plan Area.

The near-term conservation activities discussed in Appendix 12D would provide for conservation, enhancement and replacement of habitats affected by the early water conveyance facility construction activities. This conservation activity, which is part of the early implementation of the BDCP, would offset water conveyance facilities construction effects on both covered and noncovered special-status species in the study area.

As with Alternative 1B, Alternative 2B would require several mitigation measures to be adopted to reduce all effects on terrestrial biological resources to less-than-significant levels. These mitigation measures would be needed beyond the impact offsets provided by Alternative 2B AMMs and CM2–CM22 conservation actions. The relevant mitigation measures, which are included in detail in the analysis of Alternative 1B, are as follows:

- Mitigation Measure BIO-42: Avoid impacts on delta green ground beetle and its habitat
- Mitigation Measure BIO-43: Avoid and minimize loss of Callippe silverspot butterfly habitat
- Mitigation Measure BIO-55: Conduct preconstruction surveys for noncovered special-status reptiles and implement applicable CM22 measures
- Mitigation Measure BIO-69a: Restore greater sandhill crane roost habitat prior to or within the first two years of project construction
- Mitigation Measure BIO-69b: Create crane roosting habitat at a ratio of 1:1
- Mitigation Measure BIO-75: Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds
- Mitigation Measure BIO-91: Compensate for loss of high-value burrowing owl habitat
- Mitigation Measure BIO-117: Compensate for loss of suitable nesting habitat for cormorants, herons and egrets
- Mitigation Measure BIO-121: Near-term conservation of cultivated lands must include sufficient acres of crop types that benefit nesting short-eared owl and northern harrier
- Mitigation Measure BIO-130: Compensate for loss of nesting habitat for grasshopper sparrow
- Mitigation Measure BIO-138: Compensate for loss of high-value loggerhead shrike habitat
- Mitigation Measure BIO-146: Active bank swallow colonies shall be avoided and indirect effects on bank swallow will be minimized
- Mitigation Measure BIO-147: Monitor bank swallow colonies and evaluate winter and spring flows upstream of the Plan Area
- Mitigation Measure BIO-163: Conduct preconstruction survey for American badger
- Mitigation Measure BIO-166: Conduct preconstruction surveys for roosting bats and implement protective measures

- Mitigation Measure BIO-169: Apply CM22 Avoidance and Minimization Measures to noncovered special-status plant species
- Mitigation Measure BIO-179a: Conduct food studies and monitoring for wintering waterfowl in Suisun Marsh
- Mitigation Measure BIO-179b: Conduct food studies and monitoring to demonstrate food quality of palustrine tidal wetlands in the Yolo and Delta Basins
- Mitigation Measure BIO-180: Conduct food and monitoring studies of breeding waterfowl in Suisun Marsh
- Mitigation Measure BIO-181: Conduct studies to quantify shorebird food resources in tidal wetlands

12.3.3.7 Alternative 2C—Dual Conveyance with West Alignment and Intakes W1–W5 (15,000 cfs; Operational Scenario B)

Alternative 2C, which is described in Section 3.5.7 of Chapter 3, *Description of Alternatives*, and depicted in Figure 3-6, would affect terrestrial biological resources in the same manner as Alternative 1C. The Alternative 2C water conveyance facilities would entail construction at north Delta Intakes W1 through W5, just as with Alternative 1C. Also, Alternative 2C would involve constructing and operating a combined canal and tunnel conveyance system in the western portion of the Delta using the same construction footprint as Alternative 1C. The Alternative 2C operational scenario (Scenario B) would have terrestrial biology effects essentially the same as Alternative 1C and its operational scenario (Scenario A). Alternative 2C operations would involve placement of a permanent operable barrier at the head of Old River in the south Delta and increased Delta freshwater outflows during September, October and November of some water years. All of the conservation measures other than CM1 would be the same as under Alternative 1C.

The reader is referred to the Alternative 1C impact analysis above for a complete discussion of overall terrestrial biological resources effects that would result from implementation of Alternative 2C. The Alternative 2C water conveyance facilities construction effects on natural communities are included in Table 12-2C-1. The principal effects of concern associated with both Alternative 1C and 2C are related to the conversion of large acreages of cultivated lands and managed wetland to water conveyance facilities (CM1; Table 12-2C-1), tidal marsh and other habitat types (CM2, CM4, and CM5; Table 12-2C-2).

Construction of the canal on the west and northwest of Clifton Court Forebay also would have potentially significant impacts on vernal pool and alkali seasonal wetland natural communities. The large acreages impacted here would exceed the offsetting restoration and protection included in the BDCP, so additional mitigation would be required. These effects accrue to special-status species and common wildlife species that rely on cultivated lands, managed wetlands, vernal pool complex and alkali seasonal wetland complex during some life stage. Foraging raptors and passerines and some waterbirds are regular inhabitants of the Delta's cultivated lands. The Delta's managed wetlands provide freshwater nesting, feeding and resting habitat for a large number of Pacific flyway waterfowl and shorebirds, as well as nesting passerines, such as tricolored blackbird. Vernal pools provide habitat to special-status crustaceans, California tiger salamander, numerous common waterbirds, and a suite of special-status plants. Alkali seasonal wetland complex provides habitat to California tiger salamander, numerous common waterbirds, foraging raptors and its own suite of special-status, salt tolerant plants. Special-status plant species that occupy the tidal fringe in Suisun

Marsh and parts of the Delta would be subject to losses associated with physical construction activity (levee breaching and reconstruction) and changes in water depth and salinity in their current habitat as a result of tidal marsh restoration.

Note that the acres of habitat affected by CM1, as listed in Table 12-2C-1, would be acres affected in the near-term timeframe, or the first 10 years of Plan implementation. The acres represented in Table 12-2C-2 for the late long-term timeframe are acres affected cumulatively over the entire 50-year period of the Plan.

Table 12-2C-1. Alternative 2C Near-Term Effects of Water Conveyance Facilities (CM1) on Natural Communities (acres)

Natural Community	Total Existing Habitat in Study Area	Conveyance Option			
		Alternative 2C Removed Habitat (Permanent) [b]	Difference from Alternative 1C	Alternative 2C Removed Habitat (Temporary) [c]	Difference from Alternative 1C
Tidal perennial aquatic [a]	86,266	25	0	117	0
Tidal brackish emergent wetland	8,501	0	0	0	0
Tidal freshwater emergent wetland	8,953	0	0	1	0
Valley/foothill riparian	18,449	40	0	86	0
Nontidal perennial aquatic	5,587	21	0	20	0
Nontidal freshwater perennial emergent wetland	1,369	0	0	5	0
Alkali seasonal wetland complex	3,723	13	0	9	0
Vernal pool complex	9,395	29	0	32	0
Managed wetland	64,966	1	0	10	0
Other natural seasonal wetland	842	2	0	2	0
Grassland	80,355	338	0	326	0
Inland dune scrub	20	0	0	0	0
Cultivated land	511,832	4,690	0	8,489	0

[a] Tidal mudflat has been included in the tidal perennial aquatic natural community.

[b] Features in this category include the following conveyance-related facilities: Canal, Forebay, Afterbay, Intake Facilities, Pump Stations, Permanent Access Roads, Shaft Locations, Muck Disposal Areas and Borrow/Spoil Areas.

[c] Features in this category include the following conveyance features: Canal Work Area, Barge Unloading Facility, Control Structure Work Area, Intake Road Work Area, Intake Work Area, Pipeline, Pipeline Work Area, Road Work Area, Safe Haven Work Area, Temporary Access Road Work Area, Tunnel Work Area.

Table 12-2C-2. Alternative 2C Late Long-term Effects of Restoration Activities (CM2, CM4, CM5) on Natural Communities (acres)

Natural Community	Conservation Measure					
	CM2[b]	CM2	CM4[c]	CM4	CM5[d]	CM5
	Permanent[e]	Temporary[f]	Permanent[e]	Temporary[f]	Permanent[e]	Temporary[f]
Tidal perennial aquatic[a]	8	12	58	0	2	5
Tidal brackish emergent wetland	0	0	Unk.	0	0	0
Tidal freshwater emergent wetland	6	0	3	0	1	1
Valley/foothill riparian	229	149	552	0	43	35
Nontidal perennial aquatic	34	10	189	0	28	16
Nontidal freshwater perennial emergent wetland	0	1	97	0	0	0
Alkali seasonal wetland complex	45	0	27	0	0	0
Vernal pool complex	0	0	1	0	0	0
Managed wetland	24	42	12,786	0	0	0
Other natural seasonal wetland	0	0	0	0	0	0
Grassland	261	165	1,495	0	449	32
Inland dune scrub	0	0	0	0	0	0
Cultivated land	540	1	34,653	0	4,979	1,085

[a] Tidal mudflat has been included in the tidal perennial aquatic natural community.

[b] Yolo Bypass Fisheries Enhancement

[c] Tidal Natural Communities Restoration

[d] Seasonally Inundated Floodplain Restoration

[e] Features in this category include the following conveyance-related facilities: Forebay, Afterbay, Intake Facilities, Pump Stations, Permanent Access Roads, Shaft Locations, Muck Disposal Areas and Borrow/Spoil Areas.

[f] Features in this category include the following conveyance features: Barge Unloading Facility, Control Structure Work Area, Intake Road Work Area, Intake Work Area, Pipeline, Pipeline Work Area, Road Work Area, Safe Haven Work Area, Temporary Access Road Work Area, Tunnel Work Area.

Unk. = Unknown

Some of the permanent habitat loss associated with these alternatives would occur during the early, construction-related stage of the BDCP. Other losses would occur over time as some habitats (cultivated lands, managed wetland, alkali seasonal wetland complex, valley/foothill riparian and grassland) are converted to tidal marsh (tidal perennial aquatic, tidal freshwater emergent wetland, tidal brackish emergent wetland) and other natural communities. The BDCP conservation components are designed to eventually replace and expand habitats that would have a positive influence on plant and animal species covered in the Plan. These conservation components would also have a positive effect on noncovered and common species that occupy the Plan Area.

The near-term conservation activities described in Appendix 12D would provide for conservation, enhancement and replacement of habitats affected by the early water conveyance facility construction activities. This conservation activity, which is part of the early implementation of the BDCP, would offset water conveyance facilities construction effects on both covered and noncovered special-status species in the study area.

As with Alternative 1C, Alternative 2C would require several mitigation measures to be adopted to reduce all effects on terrestrial biological resources to less-than-significant levels. These mitigation measures would be needed beyond the impact offsets provided by Alternative 2C AMMs and CM2–CM22 conservation actions. The relevant mitigation measures, which are included in detail in the analysis of Alternative 1C, are as follows:

- Mitigation Measure BIO-18: Compensate for loss of alkali seasonal wetland complex
- Mitigation Measure BIO-21: Compensate for loss of vernal pool complex
- Mitigation Measure BIO-27a: Compensate for loss of other natural seasonal wetland complex
- Mitigation Measure BIO-32: Protect vernal pool crustacean habitat
- Mitigation Measure BIO-42: Avoid impacts on delta green ground beetle and its habitat
- Mitigation Measure BIO-43: Avoid and minimize loss of Callippe silverspot butterfly habitat
- Mitigation Measure BIO-55: Conduct preconstruction surveys for noncovered special-status reptiles and implement applicable CM22 measures
- Mitigation Measure BIO-69a: Restore greater sandhill crane roost habitat prior to or within the first two years of project construction
- Mitigation Measure BIO-75: Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds
- Mitigation Measure BIO-91: Compensate for loss of high-value burrowing owl habitat
- Mitigation Measure BIO-117: Compensate for loss of suitable nesting habitat for cormorants, herons and egrets
- Mitigation Measure BIO-121: Near-term conservation of cultivated lands must include sufficient acres of crop types that benefit nesting short-eared owl and northern harrier
- Mitigation Measure BIO-130: Compensate for loss of nesting habitat for grasshopper sparrow
- Mitigation Measure BIO-138: Compensate for loss of high-value loggerhead shrike habitat
- Mitigation Measure BIO-146: Active bank swallow colonies shall be avoided and indirect effects on bank swallow will be minimized

- Mitigation Measure BIO-147: Monitor bank swallow colonies and evaluate winter and spring flows upstream of the Plan Area
- Mitigation Measure BIO-163: Conduct preconstruction survey for American badger
- Mitigation Measure BIO-166: Conduct preconstruction surveys for roosting bats and implement protective measures
- Mitigation Measure BIO-169: Apply CM22 Avoidance and Minimization Measures to noncovered special-status plant species
- Mitigation Measure BIO-179a: Conduct food studies and monitoring for wintering waterfowl in Suisun Marsh
- Mitigation Measure BIO-179b: Conduct food studies and monitoring to demonstrate food quality of palustrine tidal wetlands in the Yolo and Delta Basins
- Mitigation Measure BIO-180: Conduct food and monitoring studies of breeding waterfowl in Suisun Marsh
- Mitigation Measure BIO-181: Conduct studies to quantify shorebird food resources in tidal wetlands

12.3.3.8 Alternative 3—Dual Conveyance with Pipeline/Tunnel and Intakes 1 and 2 (6,000 cfs; Operational Scenario A)

Alternative 3, which is described in Section 3.5.8 of Chapter 3, *Description of Alternatives*, and depicted in Figure 3-2, would affect terrestrial biological resources in a similar fashion to Alternative 1A. The principal differences would be related to the differing construction footprints of the water conveyance facilities (CM1). The Alternative 3 water conveyance facilities would entail construction at north Delta Intakes 1 and 2 rather than Intakes 1–5. The locations of these intakes are depicted in Figure 3-2. Eliminating Intakes 3–5 would reduce the construction footprint along the eastern bank of the Sacramento River just upstream and downstream of the community of Hood. The operational scenario for Alternative 3 (Scenario A) is the same as Alternative 1A, although less water would be diverted from the north Delta during certain periods when compared with Alternative 1A. Also, all of the conservation measures other than CM1 would be the same as under Alternative 1A. Therefore, operations and conservation effects on terrestrial biological resources would be identical under these two alternatives.

Because of the elimination of Intakes 3–5 and their associated pumps and pipelines, Alternative 3 would create differences in the permanent and temporary loss of natural communities and cultivated lands during water conveyance facilities construction when compared with Alternative 1A (Table 12-3-1). All of these differences would occur during the near-term timeframe associated with water conveyance facilities construction. Alternative 3 would permanently remove 9 fewer acres of tidal perennial aquatic habitat, 10 fewer acres of valley/foothill riparian habitat, 11 fewer acres of grassland, and 118 acres of cultivated land, all associated with less intake construction along the eastern bank of the Sacramento River in the vicinity of Hood. Alternative 3 would also permanently affect a smaller acreage of potential jurisdictional wetlands as regulated by Section 404 of the CWA, when compared to Alternative 1A (11 acres fewer).

There would be similar reductions in temporary losses of natural communities along the Sacramento River, including 31 fewer acres of tidal perennial aquatic, 3 acres fewer of tidal freshwater emergent wetland, 10 acres fewer of valley/foothill riparian, one fewer acre of nontidal perennial aquatic, 28 acres fewer grassland, and 312 acres fewer of cultivated land (Table 12-3-1). Alternative 3 would also temporarily affect a smaller acreage of potential jurisdictional wetlands as regulated by Section 404 of the CWA, when compared to Alternative 1A (42 acres fewer).

Note that the acres of habitat affected by CM1, as listed in Table 12-3-1, would be acres affected in the near-term timeframe, or the first 10 years of Plan implementation. The acres represented in Table 12-3-2 for the late long-term timeframe are acres affected cumulatively over the entire 50-year period of the Plan.

Table 12-3-1. Alternative 3 Near-Term Effects of Water Conveyance Facilities (CM1) on Natural Communities (acres)

Natural Community	Total Existing Habitat in Study Area	Conveyance Option			
		Alternative 3 Removed Habitat (Permanent)[b]	Difference from Alternativ e 1A	Alternative 3 Removed Habitat (Temporary)[c]	Difference from Alternativ e 1A
Tidal perennial aquatic[a]	86,266	39	-9	102	-31
Tidal brackish emergent wetland	8,501	0	0	0	0
Tidal freshwater emergent wetland	8,953	6	0	3	-3
Valley/foothill riparian	18,449	49	-10	18	-10
Nontidal perennial aquatic	5,587	12	0	9	-1
Nontidal freshwater perennial emergent wetland	1,369	1	0	1	0
Alkali seasonal wetland complex	3,723	0	0	9	0
Vernal pool complex	9,395	0	0	0	0
Managed wetland	64,966	3	0	8	0
Other natural seasonal wetland	842	0	0	0	0
Grassland	80,355	307	-11	234	-28
Inland dune scrub	20	0	0	0	0
Cultivated Land	511,832	3,397	-118	1,640	-312

[a] Tidal mudflat has been included in the tidal perennial aquatic natural community.

[b] Features in this category include the following conveyance-related facilities: Canal, Forebay, Afterbay, Intake Facilities, Pump Stations, Permanent Access Roads, Shaft Locations, Muck Disposal Areas and Borrow/Spoil Areas.

[c] Features in this category include the following conveyance features: Canal Work Area, Barge Unloading Facility, Control Structure Work Area, Intake Road Work Area, Intake Work Area, Pipeline, Pipeline Work Area, Road Work Area, Safe Haven Work Area, Temporary Access Road Work Area, Tunnel Work Area.

These differences in loss of natural communities would create differences in effects on covered and noncovered wildlife. The reduced level of valley/foothill riparian habitat loss would be a positive influence on valley elderberry longhorn beetle, breeding habitat for raptors, herons and egrets (great egret, snowy egret, great blue heron, Swainsons hawk, white-tailed kite, Cooper's hawk, and black-crowned night heron), and migratory habitat for species that use the river corridor, such as western yellow-billed cuckoo. Species that would benefit from smaller permanent losses of grassland and cultivated land would include foraging raptors (Swainson's hawk, short-eared owl, northern harrier, merlin and white-tailed kite), greater sandhill crane, California horned lark, tricolored blackbird, mountain plover and several species of bats. The significantly smaller temporary habitat conversions associated with Alternative 3 would have comparable benefits to these species. The differences in effect that the water conveyance facilities of Alternatives 1A and 3 could have on special-status plant species are minor. Habitat modeling indicates that Alternative 3 would create 1 fewer acre of permanent habitat loss for side-flowering skullcap, 3 fewer acres of permanent habitat loss for Mason's lilaeopsis and delta mudwort, and 5 acres less temporary loss of habitat for Mason's lilaeopsis and delta mudwort when compared with Alternative 1A.

Natural community changes associated with the other major restoration activities in Alternative 3 (CM2, CM4, and CM5; see Table 12-3-2) would be identical to those described for Alternative 1A.

Table 12-3-2. Alternative 3 Late Long-Term Effects of Restoration Activities (CM2, CM4, CM5) on Natural Communities (acres)

Natural Community	Conservation Measure					
	CM2[b]		CM4[c]		CM5[d]	
	Permanent[e]	Temporary[f]	Permanent[e]	Temporary[f]	Permanent[e]	Temporary[f]
Tidal perennial aquatic[a]	8	12	58	0	2	5
Tidal brackish emergent wetland	0	0	Unk.	0	0	0
Tidal freshwater emergent wetland	6	0	3	0	1	1
Valley/foothill riparian	229	149	552	0	43	35
Nontidal perennial aquatic	34	10	189	0	28	16
Nontidal freshwater perennial emergent wetland	0	1	97	0	0	0
Alkali seasonal wetland complex	45	0	27	0	0	0
Vernal pool complex	0	0	1	0	0	0
Managed wetland	24	42	12,786	0	0	0
Other natural seasonal wetland	0	0	0	0	0	0
Grassland	261	165	1,495	0	449	32
Inland dune scrub	0	0	0	0	0	0
Cultivated Land	3,397	1,640	34,653	0	4,979	1,085

[a] Tidal mudflat has been included in the tidal perennial aquatic natural community.
[b] Yolo Bypass Fishery Enhancement
[c] Tidal Habitat Restoration
[d] Seasonally Inundated Floodplain Restoration
[e] Features in this category include the following conveyance-related facilities: Forebay, Afterbay, Intake Facilities, Pump Stations, Permanent Access Roads, Shaft Locations, Muck Disposal Areas and Borrow/Spoil Areas.
[f] Features in this category include the following conveyance features: Barge Unloading Facility, Control Structure Work Area, Intake Road Work Area, Intake Work Area, Pipeline, Pipeline Work Area, Road Work Area, Safe Haven Work Area, Temporary Access Road Work Area, Tunnel Work Area.
Unk. = Unknown

The reader is referred to the Alternative 1A impact analysis above for the broader discussion of overall terrestrial biological resources effects that would result from implementation of Alternative 3. The principal effects of concern associated with both Alternative 1A and 3 are related to the conversion of large acreages of cultivated lands and managed wetland to tidal marsh (tidal perennial aquatic, tidal brackish emergent wetland, tidal freshwater emergent wetland) and other habitat types during restoration activities. These effects accrue to special-status species and common wildlife species that rely on cultivated lands and managed wetland during some life stage. Foraging raptors and some waterbirds are regular inhabitants of the Delta's cultivated lands. The Delta's managed wetlands provide freshwater nesting, feeding and resting habitat for a large number of Pacific flyway waterfowl and shorebirds, as well as nesting passerines, such as tricolored blackbird. Special-status plant species that occupy the tidal fringe in Suisun Marsh and parts of the Delta would be subject to losses associated with physical construction activity (levee breaching and reconstruction) and changes in water depth and salinity in their current habitat as a result of tidal marsh restoration.

Some of the permanent habitat loss associated with Alternative 3 would occur during the early, construction-related stage of the BDCP. Other losses would occur over time as some habitats (cultivated lands, managed wetland, valley/foothill riparian and grassland) are converted to tidal marsh and other natural communities. The BDCP conservation components are designed to eventually replace and expand habitats that would have a positive influence on plant and animal species covered in the Plan, including those that rely on managed wetland and cultivated land. These conservation components would also have a positive effect on noncovered and common species that occupy the Plan Area.

The near-term conservation activities described in Appendix 12D would provide for conservation, enhancement and replacement of habitats affected by the early water conveyance facility construction activities. This conservation activity, which is part of the early implementation of the BDCP, would offset water conveyance facilities construction effects on both covered and noncovered special-status species in the study area.

As with Alternative 1A, Alternative 3 would require several mitigation measures to be adopted to reduce all effects on terrestrial biological resources to less-than-significant levels. These mitigation measures would be needed beyond the impact offsets provided by Alternative 3 AMMs and CM2–CM22 conservation actions. The relevant mitigation measures, which are included in detail in the analysis of Alternative 1A, are as follows:

- Mitigation Measure BIO-42: Avoid impacts on delta green ground beetle and its habitat
- Mitigation Measure BIO-43: Avoid and minimize loss of Callippe silverspot butterfly habitat
- Mitigation Measure BIO-55: Conduct preconstruction surveys for noncovered special-status reptiles and implement applicable CM22 measures
- Mitigation Measure BIO-69a: Restore greater sandhill crane roost habitat prior to or within the first two years of project construction
- Mitigation Measure BIO-75: Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds
- Mitigation Measure BIO-91: Compensate for loss of high-value burrowing owl habitat
- Mitigation Measure BIO-117: Compensate for loss of suitable nesting habitat for cormorants, herons and egrets

- Mitigation Measure BIO-121: Near-term conservation of cultivated lands must include sufficient acres of crop types that benefit nesting short-eared owl and northern harrier
- Mitigation Measure BIO-130: Compensate for loss of nesting habitat for grasshopper sparrow
- Mitigation Measure BIO-138: Compensate for loss of high-value loggerhead shrike habitat
- Mitigation Measure BIO-146: Active bank swallow colonies shall be avoided and indirect effects on bank swallow will be minimized
- Mitigation Measure BIO-147: Monitor bank swallow colonies and evaluate winter and spring flows upstream of the Plan Area
- Mitigation Measure BIO-163: Conduct preconstruction survey for American badger
- Mitigation Measure BIO-166: Conduct preconstruction surveys for roosting bats and implement protective measures
- Mitigation Measure BIO-169: Apply CM22 Avoidance and Minimization Measures to noncovered special-status plant species
- Mitigation Measure BIO-179a: Conduct food studies and monitoring for wintering waterfowl in Suisun Marsh
- Mitigation Measure BIO-179b: Conduct food studies and monitoring to demonstrate food quality of palustrine tidal wetlands in the Yolo and Delta Basins
- Mitigation Measure BIO-180: Conduct food and monitoring studies of breeding waterfowl in Suisun Marsh
- Mitigation Measure BIO-181: Conduct studies to quantify shorebird food resources in tidal wetlands

12.3.3.9 Alternative 4—Dual Conveyance with Pipeline/Tunnel and Intakes 2, 3 and 5 (9,000 cfs; Operational Scenario H)

Section 3.5.9 in Chapter 3, *Description of Alternatives*, provides details of Alternative 4, and Figure 3-2 depicts the alternative.

Natural Communities

Tidal Perennial Aquatic

Construction, operation, maintenance and management associated with the conservation components of BDCP Alternative 4 would have no long-term adverse effects on the habitats associated with the tidal perennial aquatic natural community. Initial development and construction of CM1, CM2, CM4, CM5, and CM6 would result in both permanent and temporary removal or modification of this community. However, establishing natural community protection (CM3) and implementing natural community restoration (CM4) and management (CM11) would expand and improve tidal perennial aquatic habitat in the study area (see Table 12-4-1).

Note that two time periods are represented in Table 12-4-1 and the other tables contained in the analysis of Alternative 4. The near-term (NT) acreage effects listed in the table would occur over the first 10 years of Plan implementation. The late long-term (LLT) effects contained in these tables represent the cumulative effects of all activities over the entire 50-year term of the Plan.

Table 12-4-1. Changes in Tidal Perennial Aquatic Natural Community Associated with Alternative 4 (acres)[a]

Habitat Affected[c]	Conservation Measure[b]	Permanent		Temporary		Periodic[d]	
		NT	LLT	NT	LLT	Yolo	Floodplain
	CM1	41	41	108	108		
	CM2	8	8	12	12	9–36	
	CM4	51	58				
	CM5		2		5		39
	CM6	Unk.	Unk.	Unk.	Unk.	Unk.	Unk.
	TOTAL IMPACTS	**100**	**109**	**120**	**125**	**9–36**	**39**
Habitat Restored/Created[e]		2,500	10,000				
Habitat Protected[e]							

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late long-term timeframes.

[b] See discussion below for a description of applicable CMs.

[c] LLT acreages are a summation of effects that would occur in the near-term, early long-term and late long-term timeframes. The LLT acreages represent the total amount of habitat that would be affected over the 50-year life of the BDCP and do not reflect habitat increases that would result from restoration, creation and protection activities.

[d] Periodic effects were estimated for the late long-term only.

[e] Restored/created and protected habitat acreages represent planned conservation activities that would be implemented over the timeframes identified in the BDCP (see BDCP Chapter 3, *Conservation Strategy*, for specifics).

NT = near-term
LLT = late long-term
NA = not applicable
Unk. = unknown

Impact BIO-1: Changes in tidal perennial aquatic natural community as a result of implementing BDCP conservation measures

Construction and land grading activities that would accompany the implementation of CM1, CM2, CM4, CM5, and CM6 for Alternative 4 would permanently affect an estimated 109 acres and temporarily remove 125 acres of tidal perennial aquatic natural community in the study area. Use of the alternative transmission alignment being considered with Alternative 4 would reduce this total impact by 12 acres. These modifications represent less than 1% of the 86,266 acres of the community that is mapped in the study area. The majority of the permanent and temporary effects would happen during the first 10 years of BDCP implementation, as water conveyance facilities are constructed and habitat restoration is initiated. Natural communities restoration would add 2,500 acres of tidal perennial aquatic natural community during the same period, which would greatly expand the area of that habitat and offset the losses (thereby making them not adverse under NEPA and less than significant under CEQA). The individual effects of each relevant conservation measure are addressed below. A summary statement of the combined impacts and NEPA and CEQA conclusions follows the individual conservation measure discussions.

- *CM1 Water Facilities and Operation:* Construction of the Alternative 4 water conveyance facilities would permanently remove 41 acres and temporarily remove 108 acres of tidal perennial aquatic community. Most of the permanent loss would occur where Intakes 2, 3, and 5 encroach on the Sacramento River's east bank between Clarksburg and Courtland (see Terrestrial Biology Mapbook). The footings and the screens at the intake sites would be placed into the river margin and would displace moderately deep to shallow, flowing open water with a mud substrate and very little aquatic vegetation. A small area (less than 1 acre) of this community would also be lost to forebay construction approximately 1.2 miles south of Hood Franklin Road and immediately west of Stone Lakes NWR. The temporary effects on tidal perennial aquatic habitats would occur at numerous locations, including in the Sacramento River at Intakes 2, 3, and 5, and at temporary barge unloading facilities established at five locations along the tunnel route. The barge unloading construction would temporarily affect the Sacramento River just downstream of Walnut Grove, the North Mokelumne River adjacent to the east side of Tyler Island, the San Joaquin River in the Venice Reach just south of Venice Island, Middle River on the east side of Bacon Island just downstream of Empire Reach, and the North Victoria Canal between Woodward and Victoria Islands. The details of these locations can be seen in the Terrestrial Biology Mapbook. These losses would take place during the near-term construction period.

The temporary and permanent losses of tidal perennial aquatic natural community associated with constructing the Alternative 4 water conveyance facility would be decreased slightly by selecting the alternative east-west transmission line alignment. Potentially, there would be 11 acres less of permanent and 1 acre less of temporary losses because the Alternative 4.1 transmission corridor would cross fewer tidal perennial aquatic areas. This differential is not significant, however, because implementation of CM22 would reduce or eliminate the potential for construction of transmission towers in aquatic environments, regardless of the transmission corridor selected.

- *CM2 Yolo Bypass Fisheries Enhancement*: Implementation of CM2 involves a number of construction activities within the Yolo and Sacramento Bypasses, including Fremont Weir and stilling basin improvements, Putah Creek realignment activities, Lisbon Weir modification and Sacramento Weir improvements. Some of these activities could involve excavation and grading in tidal perennial aquatic areas to improve passage of fish through the bypasses. Based on hypothetical construction footprints, a total of 8 acres could be permanently lost and another 12 acres could be temporarily removed. This activity would occur primarily in the near-term timeframe.
- *CM4 Tidal Natural Communities Restoration*: Based on the use of hypothetical restoration footprints, implementation of CM4 would affect 58 acres of tidal perennial aquatic community. CM4 involves conversion of existing natural communities to a variety of tidal wetlands, including tidal perennial aquatic, tidal brackish emergent, and tidal freshwater emergent wetlands. Specific locations for these conversions are not known. The 58 acres could remain tidal perennial aquatic with a modified tidal prism, or they could eventually be converted to one of the other tidal wetland types. For purposes of this analysis, a conservative approach has been taken and the effect has been discussed simultaneously with the habitat losses associated with other conservation measures. An estimated 10,000 acres of tidal perennial aquatic community would be restored during tidal habitat restoration. Approximately 2,500 acres of the restoration would happen during the first 10 years of BDCP implementation, which would coincide with the timeframe of water conveyance facilities construction. The remaining restoration would be spread over the following 30 years. Tidal natural communities restoration is expected to be focused in the ROAs identified in Figure 12-1. Some of the restoration would occur in the lower

Yolo Bypass, but restoration would also be spread among the Suisun Marsh, South Delta, Cosumnes/Mokelumne and West Delta ROAs.

- *CM5 Seasonally Inundated Floodplain Restoration*: Floodplain restoration levee construction would permanently remove 2 acres and temporarily remove 5 acres of tidal perennial aquatic habitat. The construction-related losses would be considered a permanent removal of the tidal perennial aquatic habitats directly affected. This activity is scheduled to start following construction of water conveyance facilities, which is expected to take 10 years.
- *CM6 Channel Margin Enhancement*: Channel margin habitat enhancement could result in filling of small amounts of tidal perennial aquatic habitat along 20 miles of river and sloughs. The extent of this loss cannot be quantified at this time, but the majority of the enhancement activity would occur on tidal perennial aquatic habitat margins, including levees and channel banks. The improvements would occur within the study area on sections of the Sacramento, San Joaquin and Mokelumne Rivers, and along Steamboat and Sutter Sloughs.

The following paragraphs summarize the combined effects discussed above and describe other BDCP conservation actions that offset or avoid these effects. NEPA and CEQA impact conclusions are also included.

Near-Term Timeframe

During the near-term timeframe (the first 10 years of BDCP implementation), Alternative 4 would affect the tidal perennial aquatic community through CM1 construction losses (41 acres permanent and 108 acres temporary) and the CM2 construction losses (8 acres permanent and 12 acres temporary). These losses would occur primarily along the Sacramento River at intake sites or in the northern Yolo Bypass. Approximately 51 acres of the inundation and construction-related effects resulting from CM4 would occur during the near-term throughout the ROAs mapped in Figure 3-1.

The construction losses of this special-status natural community would represent an adverse effect if they were not offset by avoidance and minimization measures and restoration actions associated with BDCP conservation components. Loss of tidal perennial aquatic natural community would be considered both a loss in acreage of a sensitive natural community and a loss of waters of the United States as defined by Section 404 of the CWA. However, the creation of 2,500 acres of tidal perennial aquatic natural community as part of CM4 during the first 10 years of BDCP implementation would more than offset this near-term loss, avoiding any adverse effect. This conclusion would be true with either of the two transmission line alignments being considered for Alternative 4. Typical project-level mitigation ratios (1:1 for restoration) would indicate 220 acres of restoration would be needed to offset (i.e., mitigate for) the 220 acres of effect associated with near-term activities, including water conveyance facility construction.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training*, *AMM2 Construction Best Management Practices and Monitoring*, *AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan*, *AMM7 Barge Operations Plan*, and *AMM10 Restoration of Temporarily Affected Natural Communities*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats at work areas and disposal sites. The AMMs are described in detail in BDCP Appendix 3.C.

Late Long-Term Timeframe

Implementation of Alternative 4 as a whole would result in relatively minor (less than 1%) conversions of or losses to tidal perennial aquatic community in the study area. These losses or conversions (109 acres of permanent and 125 acres of temporary) would be largely associated with construction of the water conveyance facilities (CM1), construction of Yolo Bypass fish improvements (CM2), and inundation during tidal marsh restoration (CM4). Inundation conversions would occur over the 40-year life of the Plan's restoration program at various tidal restoration sites throughout the study area. By the end of the Plan timeframe, a total of 10,000 acres of this natural community would be restored. The restoration would occur over a wide region of the study area, including within the Suisun Marsh, Cosumnes/Mokelumne, Cache Creek, and South Delta ROAs (see Figure 12-1). Therefore, Alternative 4 would not result in a net long-term reduction in the acreage of a sensitive natural community and would not have an adverse effect on this natural community; the effect would be beneficial.

CEQA Conclusion:

Near-Term Timeframe

Alternative 4 would result in the near-term loss or conversion of approximately 220 acres of tidal perennial aquatic natural community due to construction of the water conveyance facilities (CM1) and fish passage improvements (CM2), and inundation during tidal marsh restoration (CM4). The construction losses would occur primarily along the Sacramento River at intake sites, along various Delta waterways at barge offloading sites, and within the northern section of the Yolo Bypass, while inundation conversions would occur at various tidal restoration sites throughout the study area. The losses and conversions would be spread across a 10-year near-term timeframe. These losses and conversions would be offset by planned restoration of 2,500 acres of tidal perennial aquatic natural community scheduled for the first 10 years of BDCP implementation (CM4). AMM1, AMM2, AMM6, AMM7, and AMM10 would also be implemented to minimize impacts. Because of these offsetting near-term restoration activities and AMMs, impacts would be less than significant. This conclusion would be true with either of the two transmission line alignments being considered for Alternative 4. Typical project-level mitigation ratios (1:1 for restoration) would indicate that 220 acres of restoration would be needed to offset (i.e., mitigate for) the 220 acres of loss or conversion. The restoration would be initiated at the beginning of Plan implementation to minimize any time lag in the availability of this habitat to special-status species, and would result in a net gain in acreage of this sensitive natural community.

Late Long-Term Timeframe

At the end of the Plan period, 234 acres of the natural community would be lost or converted and 10,000 acres of this community would be restored. There would be no net permanent reduction in the acreage of this sensitive natural community within the study area. Therefore, Alternative 4 would not have a substantial adverse effect on this natural community; the impact would be beneficial.

Impact BIO-2: Increased frequency and duration of periodic inundation of tidal perennial aquatic natural community

Two Alternative 4 conservation measures would modify the water depths and flooding regimes of both natural and man-made waterways in the study area. CM2, which is designed to improve fish passage and shallow flooded habitat for Delta fishes in the Yolo Bypass, would increase periodic flooding of tidal perennial aquatic natural community on small acreages, while CM5 would expose this community to additional flooding as channel margins are modified and levees are set back to improve fish habitat along some of the major rivers and waterways throughout the study area.

- *CM2 Yolo Bypass Fisheries Enhancement*: Operation of the Yolo Bypass under Alternative 4 would result in an increase in the frequency and duration of flood-related changes in water depth and velocity of 9–36 acres of tidal perennial aquatic natural community. The area more frequently affected by flooding would vary with the flow regime eventually selected at the newly-constructed notch in the Fremont Weir. Most of this community occurs in the southern section of the bypass on Liberty Island, and, to a lesser extent, along the eastern edge of the bypass, including the Tule Canal/Toe Drain. The anticipated change in management of flows in the Yolo Bypass includes more frequent releases in flows into the bypass from the Fremont and Sacramento Weirs, and in some years, later releases into the bypass in Spring months. The modification of periodic flood events would be expected to create a beneficial effect on the ecological function of tidal perennial aquatic habitat in the bypass, especially as it relates to BDCP target aquatic species. The modifications would not result in a loss of this community. The extended flooding would be designed to expand foraging and spawning habitat for Delta fishes. The effects of these changes in the flooding regime on terrestrial species that rely on tidal perennial aquatic habitats are discussed later in this chapter, under the individual species assessments.
- *CM5 Seasonally Inundated Floodplain Restoration*: Floodplain restoration would result in an increase in the frequency and duration of flooding of 39 acres of tidal perennial aquatic habitat. Specific locations for this restoration activity have not been identified, but they would likely be focused in the south Delta area, along the major rivers and Delta channels. The reconnection of these wetlands to stream flooding events would be beneficial to the ecological function of tidal perennial aquatic habitats, especially as they relate to BDCP target aquatic species. Foraging activity and refuge sites would be expanded into areas currently unavailable or infrequently available to some aquatic species.

In summary, from 48–75 acres of tidal perennial aquatic community in the study area would be subjected to more frequent increases in water depth and velocity from flood flows as a result of implementing two Alternative 4 conservation measures (CM2 and CM5). Tidal perennial aquatic community is already, by definition, permanently inundated aquatic habitat of great value to aquatic species in the study area; therefore, periodic changes in water depth and velocity would not result in a net permanent reduction in the acreage of this community in the study area. Increasing periodic flooding of tidal perennial aquatic natural community would have a beneficial effect on the community.

CEQA Conclusion: An estimated 48–75 acres of tidal perennial aquatic community in the study area would be subjected to more frequent increases in water depth and velocity from flood flows as a result of implementing CM2 and CM5 under Alternative 4. Tidal perennial aquatic community is already, by definition, permanently inundated aquatic habitat of great value to aquatic species in the study area. The periodic inundation would not result in a net permanent reduction in the acreage of this community in the study area. Therefore, there would no substantial adverse effect on the community. The impact would be beneficial.

Impact BIO-3: Modification of tidal perennial aquatic natural community from ongoing operation, maintenance and management activities

Once the physical facilities associated with BDCP Alternative 4 are constructed and the stream flow regime associated with changed water management is in effect, there would be new ongoing and periodic actions associated with operation, maintenance and management of the BDCP facilities and conservation lands that could affect tidal perennial aquatic natural community in the study area. The ongoing actions include diverting Sacramento River flows in the north Delta, and reduced diversion from south Delta channels. These actions are associated with CM1 (see Impact BIO-2 for effects associated with CM2). The periodic actions would involve access road and conveyance facility repair, vegetation management at the various water conveyance facilities and habitat restoration sites (CM13), levee repair and replacement of levee armoring, channel dredging, and habitat enhancement in accordance with natural community management plans. The potential effects of these actions are described below.

- *Modified river flows upstream of and within the study area and reduced diversions from south Delta channels.* Changes in releases from reservoirs upstream of the study area, increased diversion of Sacramento River flows in the north Delta, and reduced diversion from south Delta channels would not result in the permanent reduction in acreage of a sensitive natural community in the study area. Flow levels in the upstream rivers would not change such that the acreage of tidal perennial aquatic community would be reduced on a permanent basis. Some minor increases and some decreases would be expected to occur during some seasons and in some water-year types, but there would be no permanent loss. Similarly, increased diversions of Sacramento River flows in the north Delta would not result in a permanent reduction in tidal perennial aquatic community downstream of these diversions. Tidal influence on water levels in the Sacramento River and Delta waterways would continue to be dominant. Reduced diversions from the south Delta channels would not create a reduction in this natural community.
- *Access road, water conveyance facility and levee repair.* Periodic repair of access roads, water conveyance facilities and levees associated with the BDCP actions have the potential to require removal of adjacent vegetation and could entail earth and rock work in tidal perennial aquatic habitats. This activity could lead to increased soil erosion, turbidity and runoff entering tidal perennial aquatic habitats. These activities would be subject to normal erosion, turbidity and runoff control management practices, including those developed as part of *AMM2 Construction Best Management Practices and Monitoring* and *AMM4 Erosion and Sediment Control Plan.* Any vegetation removal or earthwork adjacent to or within aquatic habitats would require use of sediment and turbidity barriers, soil stabilization and revegetation of disturbed surfaces. Proper implementation of these measures would avoid permanent adverse effects on this community.
- *Vegetation management.* Vegetation management, in the form of physical removal and chemical treatment, would be a periodic activity associated with the long-term maintenance of water conveyance facilities and restoration sites. Vegetation management is also the principal activity associated with *CM13 Invasive Aquatic Vegetation Control.* Use of herbicides to control nuisance vegetation could pose a long-term hazard to tidal perennial aquatic natural community at or adjacent to treated areas. The hazard could be created by uncontrolled drift of herbicides, uncontrolled runoff of contaminated stormwater onto the natural community, or direct discharge of herbicides to tidal perennial aquatic areas being treated for invasive species removal. This risk is also discussed in Chapter 24, *Hazards and Hazardous Materials,* as Impact HAZ-6. Environmental commitments and *AMM5 Spill Prevention, Containment, and Countermeasure Plan* have been made part of the BDCP to reduce hazards to humans and the environment from use of various chemicals during maintenance activities, including the use of herbicides. These commitments are described in Appendix 3B, including the commitment to prepare and implement spill prevention and control plans and stormwater pollution prevention plans. Best management practices, including control of drift and runoff from treated areas, and use of herbicides approved for use in aquatic environments would also reduce the risk of

affecting natural communities adjacent to water conveyance features and levees associated with restoration activities.

Herbicides to remove aquatic invasive species as part of CM13 would be used to restore the normal ecological function of tidal aquatic habitats in planned restoration areas. The treatment activities would be conducted in concert with the California Department of Boating and Waterways' invasive species removal program. Eliminating large stands of water hyacinth and Brazilian waterweed would improve habitat conditions for some aquatic species by removing cover for nonnative predators, improving water flow and removing barriers to movement (see Chapter 11, *Fish and Aquatic Resources*). These habitat changes should also benefit terrestrial species that use tidal perennial aquatic natural community for movement corridors and for foraging. Vegetation management effects on individual species are discussed in the species sections on following pages.

- *Channel dredging.* Long-term operation of the Alternative 4 intakes on the Sacramento River would include periodic dredging of sediments that might accumulate in front of intake screens. The dredging would occur in tidal perennial aquatic natural community and would result in short-term increases in turbidity and disturbance of the substrate. These conditions would not eliminate the community, but would diminish its value for special-status and common species that rely on it for movement corridor or foraging area. The individual species effects are discussed later in this chapter.
- *Habitat enhancement.* The BDCP includes a long-term management element for the natural communities within the Plan Area (CM11). For tidal perennial aquatic natural community, a management plan would be prepared that specifies actions to improve the value of the habitats for covered species. Actions would include control of invasive nonnative plant and animal species, fire management, restrictions on vector control and application of herbicides, and maintenance of infrastructure that would allow for movement through the community. The enhancement efforts would improve the long-term value of this community for both special-status and common species.

The various operations and maintenance activities described above could alter acreage of tidal perennial aquatic natural community in the study area through changes in flow patterns and changes in periodic flooding of this community. Activities could also introduce sediment and herbicides that would reduce the value of this community to common and sensitive plant and wildlife species. Other periodic activities associated with the Plan, including management, protection and enhancement actions associated with *CM3 Natural Communities Protection and Restoration* and *CM11 Natural Communities Enhancement and Management*, would be undertaken to enhance the value of the community. While some of these activities could result in small reductions in acreage, these reductions would be greatly offset by restoration activities planned as part of *CM4 Tidal Natural Communities Restoration*. The management actions associated with levee repair, periodic dredging and control of invasive plant species would also result in a long-term benefit to the species associated with tidal perennial aquatic habitats by improving water movement. Ongoing operation, maintenance and management activities would not result in a net permanent reduction in this sensitive natural community within the study area. Therefore, there would be no adverse effect on the tidal perennial aquatic natural community.

CEQA Conclusion:

The operation and maintenance activities associated with Alternative 4 would have the potential to create minor losses in total acreage of tidal perennial aquatic natural community in the study area, and could create temporary increases in turbidity and sedimentation. The activities could also introduce herbicides periodically to control nonnative, invasive plants. Implementation of environmental commitments and AMM2, AMM4, and AMM5 would minimize these impacts, and other operations and maintenance activities, including management, protection and enhancement actions associated with *CM3 Natural Communities Protection and Restoration* and *CM11 Natural Communities Enhancement and Management*, would create positive effects, including improved water movement in these habitats. Long-term restoration activities associated with *CM4 Tidal Natural Communities Restoration* would greatly expand this natural community in the study area. Ongoing operation, maintenance and management activities would not result in a net permanent reduction in this sensitive natural community within the study area. Therefore, there would be a less-than-significant impact on the tidal perennial aquatic natural community.

Tidal Brackish Emergent Wetland

Construction, operation, maintenance and management associated with the conservation components of Alternative 4 would have no adverse effect on the habitats associated with the tidal brackish emergent wetland natural community. Establishing natural communities protection and restoration (CM4) and implementing natural communities enhancement and management (CM11) would benefit tidal brackish emergent wetland, especially in Suisun Marsh (CZ 11). Most of the other conservation measures would have no effects on tidal brackish emergent wetland. Implementation of tidal habitat restoration (CM4) would affect very small acreages of existing tidal brackish emergent wetland in Suisun Marsh (see Table 12-4-2).

Table 12-4-2. Changes in Tidal Brackish Emergent Wetland Natural Community Associated with Alternative 4 (acres)[a]

Habitat Affected[c]	Conservation Measure[b]	Permanent		Temporary		Periodic[d]	
		NT	LLT	NT	LLT	Yolo	Floodplain
	CM1						
	CM2						
	CM4	Unk.	Unk.	Unk.	Unk.		
	CM5						
	CM6						
	TOTAL IMPACTS						
Habitat Restored/Created[e]		1,000	3,000				
Habitat Protected[e]							

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late long-term timeframes.
[b] See discussion below for a description of applicable CMs.
[c] LLT acreages are a summation of effects that would occur in the near-term, early long-term and late long-term timeframes. The LLT acreages represent the total amount of habitat that would be affected over the 50-year life of the BDCP and do not reflect habitat increases that would result from restoration, creation and protection activities.
[d] Periodic effects were estimated for the late long-term only.
[e] Restored/created and protected habitat acreages represent planned conservation activities that would be implemented over the timeframes identified in the BDCP (see BDCP Chapter 3, *Conservation Strategy*, for

specifics).
NT = near-term
LLT = late long-term
NA = not applicable
Unk. = unknown

Impact BIO-4: Changes in tidal brackish emergent wetland natural community as a result of implementing BDCP conservation measures

Construction and operation of the Alternative 4 water conveyance facilities (CM1) would not affect tidal brackish emergent wetland natural community.

Restoration of tidal marsh habitats associated with CM4 would require site preparation, earthwork, and other site activities that could remove tidal brackish emergent wetland. Levee modifications, grading or contouring, filling to compensate for land subsidence, and creation of new channels could also result in the removal of tidal brackish emergent wetland. All of this construction and land modification activity that could affect tidal brackish emergent wetland would take place in Suisun Marsh (CZ 11). The acreage of loss has not been calculated because the specific locations for site preparation and earthwork have not been identified, but the loss would likely be very small. These activities would occur in small increments over the 40-year life of the CM4 restoration program. The protection and restoration elements of CM4 would greatly exceed any of the short-term losses described above. At least 3,000 acres of tidal brackish emergent wetland would be restored in the Plan Area, with 1,000 acres of restoration occurring in the near-term timeframe (Table 12-4-2). In addition, the habitat and ecosystem functions of BDCP restored tidal brackish emergent wetland would be maintained and enhanced. This increase of tidal brackish emergent wetland would be a beneficial effect.

CEQA Conclusion: Tidal brackish emergent wetland natural community could experience small losses in acreage in Suisun Marsh (CZ 11) as a result of the large-scale tidal marsh restoration planned as part of CM4. These losses would be associated with levee modification, site preparation and other earthwork needed to expose diked lands to tidal influence. Because at least 3,000 acres of tidal brackish emergent wetland would be restored in the Plan Area as part of CM4, including 1,000 acres restored in the near-term timeframe, there would be a large increase in tidal brackish emergent wetland both in the near-term and over the life of the Plan. Therefore, this impact would be beneficial.

Impact BIO-5: Modification of tidal brackish emergent wetland natural community from ongoing operation, maintenance and management activities

Once the physical facilities associated with CM4 of BDCP Alternative 4 are constructed and the water management associated with marsh restoration is in effect, there would be new ongoing and periodic actions associated with operation, maintenance and management of the CM4 wetlands that could affect tidal brackish emergent wetland natural community in the study area. The ongoing actions include access road and levee repair, and replacement of levee armoring, channel dredging, and habitat enhancement in accordance with natural community management plans. The potential effects of these actions are described below.

- *Access road and levee repair.* Periodic repair of access roads and levees associated with the BDCP actions have the potential to require removal of adjacent vegetation and could entail earth and rock work in tidal brackish emergent wetland habitats. This activity could lead to increased soil erosion, turbidity and runoff entering these habitats. The activities would be subject to normal erosion, turbidity and runoff control management practices, including those developed as part of *AMM2 Construction Best Management Practices and Monitoring* and *AMM4 Erosion and Sediment Control Plan*. Any vegetation removal or earthwork adjacent to or within aquatic habitats would require use of sediment and turbidity barriers, soil stabilization and revegetation of disturbed surfaces. Proper implementation of these measures would avoid permanent adverse effects on this community.

- *Vegetation management.* Vegetation management, in the form of physical removal and chemical treatment, would be a periodic activity associated with the long-term maintenance of restoration sites. Vegetation management is also the principal activity associated with *CM13 Invasive Aquatic Vegetation Control.* Use of herbicides to control nuisance vegetation could pose a long-term hazard to tidal brackish emergent wetland natural community at or adjacent to treated areas. The hazard could be created by uncontrolled drift of herbicides, uncontrolled runoff of contaminated stormwater onto the natural community, or direct discharge of herbicides to wetland areas being treated for invasive species removal. This risk is also discussed in Chapter 24, *Hazards and Hazardous Materials,* as Impact HAZ-6. Environmental commitments and *AMM5 Spill Prevention, Containment, and Countermeasure Plan* have been made part of the BDCP to reduce hazards to humans and the environment from use of various chemicals during maintenance activities, including the use of herbicides. These commitments are described in Appendix 3B, including the commitment to prepare and implement spill prevention and control plans and stormwater pollution prevention plans. Best management practices, including control of drift and runoff from treated areas, and use of herbicides approved for use in aquatic environments would also reduce the risk of affecting natural communities adjacent to levees associated with tidal wetland restoration activities.

  Herbicides to remove aquatic invasive species as part of CM13 would be used to restore the normal ecological function of tidal aquatic habitats in planned restoration areas. The treatment activities would be conducted in concert with the California Department of Boating and Waterways' invasive species removal program. Eliminating large stands of water hyacinth and Brazilian waterweed would improve habitat conditions for some aquatic species by removing cover for nonnative predators, improving water flow and removing barriers to movement (see Chapter 11, *Fish and Aquatic Resources*). These habitat changes should also benefit terrestrial species that use tidal brackish emergent wetland natural community for movement corridors and for foraging. Vegetation management effects on individual species are discussed in the species sections on following pages.

- *Channel dredging.* Long-term maintenance of tidal channels that support wetland expansion in Suisun Marsh would include periodic dredging of sediments. The dredging would occur adjacent to tidal brackish emergent wetland natural community and would result in short-term increases in turbidity and disturbance of the substrate. These conditions would not eliminate the community, but would diminish its value in the short term for special-status and common species that rely on it for cover, movement corridor or foraging area. The individual species effects are discussed later in this chapter.

- *Habitat enhancement.* The BDCP includes a long-term management element for the natural communities within the Plan Area (CM11). For tidal brackish emergent wetland natural community, a management plan would be prepared that specifies actions to improve the value of the habitats for covered species. Actions would include control of invasive nonnative plant and animal species, fire management, restrictions on vector control and application of herbicides, and maintenance of infrastructure that would allow for movement through the community. The enhancement efforts would improve the long-term value of this community for both special-status and common species.

The various operations and maintenance activities described above could alter acreage of tidal brackish emergent wetland natural community in the study area through levee and road maintenance, channel dredging and vegetation management in or adjacent to this community. Activities could also introduce sediment and herbicides that would reduce the value of this community to common and sensitive plant and wildlife species. Other periodic activities associated with the Plan, including management, protection and enhancement actions associated with *CM3 Natural Communities Protection and Restoration* and *CM11 Natural Communities Enhancement and Management*, would be undertaken to enhance the value of the community. While some of these activities could result in small changes in acreage, these changes would be greatly offset by restoration activities planned as part of *CM4 Tidal Natural Communities Restoration*. The management actions associated with levee repair, periodic dredging and control of invasive plant species would also result in a long-term benefit to the species associated with tidal brackish emergent wetland habitats by improving water movement. Ongoing operation, maintenance and management activities would not result in a net permanent reduction in this sensitive natural community within the study area. Therefore, there would be no adverse effect on the tidal brackish emergent wetland natural community.

CEQA Conclusion: The operation and maintenance activities associated with Alternative 4 would have the potential to create minor changes in total acreage of tidal brackish emergent wetland natural community in the study area, and could create temporary increases in turbidity and sedimentation. The activities could also introduce herbicides periodically to control nonnative, invasive plants. Implementation of environmental commitments and AMM2, AMM4, and AMM5 would minimize these impacts, and other operations and maintenance activities, including management, protection and enhancement actions associated with *CM3 Natural Communities Protection and Restoration* and *CM11 Natural Communities Enhancement and Management*, would create positive effects, including improved water movement in these habitats. Long-term restoration activities associated with *CM4 Tidal Natural Communities Restoration* would greatly expand this natural community in the study area. Ongoing operation, maintenance and management activities would not result in a net permanent reduction in this sensitive natural community within the study area. Therefore, there would be a less-than-significant impact.

Tidal Freshwater Emergent Wetland

Construction, operation, maintenance and management associated with the conservation components of Alternative 4 would have no long-term adverse effects on the habitats associated with the tidal freshwater emergent wetland natural community. Initial development and construction of CM1, CM2, CM4, CM5, and CM6 would result in both permanent and temporary removal of small acreages of this community. However, establishing natural community protection (CM3) and implementing natural community restoration (CM4) and management (CM11) would expand and improve tidal freshwater emergent wetland natural community in the study area (see Table 12-4-3).

Table 12-4-3. Changes in Tidal Freshwater Emergent Wetland Natural Community Associated with Alternative 4 (acres)[a]

Habitat Affected[c]

	Conservation Measure[b]	Permanent					
		NT	LLT	NT	LLT	Yolo	Floodplain
	CM1	6	6	5	5		
	CM2	6	6			24–58	
	CM4	3	3				
	CM5		1		1		3
	CM6	Unk.	Unk.	Unk.	Unk.	Unk.	Unk.
	TOTAL IMPACTS	**15**	**16**	**5**	**6**	**24–58**	**3**
Habitat Restored/Created[e]		5,200	13,900				
Habitat Protected[e]							

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late long-term timeframes.
[b] See discussion below for a description of applicable CMs.
[c] LLT acreages are a summation of effects that would occur in the near-term, early long-term and late long-term timeframes. The LLT acreages represent the total amount of habitat that would be affected over the 50-year life of the BDCP and do not reflect habitat increases that would result from restoration, creation and protection activities.
[d] Periodic effects were estimated for the late long-term only.
[e] Restored/created and protected habitat acreages represent planned conservation activities that would be implemented over the timeframes identified in the BDCP (see BDCP Chapter 3, *Conservation Strategy*, for specifics).
NT = near-term
LLT = late long-term
NA = not applicable
Unk. = unknown

Impact BIO-6: Changes in tidal freshwater emergent wetland natural community as a result of implementing BDCP conservation measures

Construction and land grading activities that would accompany the implementation of CM1, CM2, CM4, CM5, and CM6 for Alternative 4 would permanently eliminate an estimated 16 acres and temporarily remove 6 acres of tidal freshwater emergent wetland natural community in the study area. These modifications represent less than 1% of the 8,953 acres of the community that is mapped in the study area. The majority of the permanent and temporary losses would happen during the first 10 years of BDCP implementation, as water conveyance facilities are constructed and habitat restoration is initiated. Natural communities restoration would add 5,200 acres of tidal freshwater emergent wetland natural community during the same period, which would greatly expand the area of that habitat and offset the losses, thereby making them not adverse under NEPA and less than significant under CEQA. The individual effects of each relevant conservation measure are addressed below. A summary statement of the combined impacts and NEPA and CEQA conclusions follows the individual conservation measure discussions.

- *CM1 Water Facilities and Operation:* Construction of the Alternative 4 water conveyance facilities would permanently remove 6 acres and temporarily remove 5 acres of tidal freshwater emergent wetland community. Most of the loss would occur in the vicinity of Hood, just south of the Hood Franklin Road associated with intake construction, and along rivers and canals in the central Delta from barge unloading facility construction (Middle River on the east side of Bacon

Island and the North Victoria Canal at the north end of Victoria Island; see Terrestrial Biology Mapbook). These losses would take place during the near-term construction period.

There would be a 1-acre reduction in temporary losses of tidal freshwater emergent wetland natural community associated with constructing the east-west transmission line for Alternative 4 water conveyance facilities rather than the north-south transmission line alignment.

- *CM2 Yolo Bypass Fisheries Enhancement:* Implementation of CM2 involves a number of construction or channel modification activities within the Yolo and Sacramento Bypasses, including improvements in flow through the west side channel of the bypass, Putah Creek realignment activities, Lisbon Weir modification and Sacramento Weir improvements. All of these activities could involve excavation and grading in tidal freshwater emergent wetland areas to improve passage of fish through the bypasses. Based on hypothetical construction footprints, a total of 6 acres could be permanently lost to these activities. The loss is expected to occur in the first 10 years of Plan implementation.
- *CM4 Tidal Natural Communities Restoration:* Based on hypothetical footprints of this restoration activity, initial land grading and levee modification could permanently remove up to 3 acres of tidal freshwater emergent wetland natural community. This loss would occur in the near-term timeframe and would occur throughout the ROAs identified for tidal wetland restoration. At the same time, an estimated 13,900 acres of tidal freshwater emergent wetland community would be restored during tidal habitat restoration (CM4). Approximately 5,200 acres of the restoration would happen during the first 10 years of BDCP implementation, which would coincide with the timeframe of water conveyance facilities construction. The remaining restoration would be spread over the following 30 years. Tidal wetland communities restoration is expected to be focused in the ROAs identified in Figure 12-1. Some of the restoration would be implemented in the lower Yolo Bypass, but restoration would also be spread among the Suisun Marsh, South Delta, Cosumnes/Mokelumne and West Delta ROAs.
- *CM5 Seasonally Inundated Floodplain Restoration:* Floodplain restoration levee construction would permanently remove 1 acre and temporarily remove 1 acre of tidal freshwater emergent wetland habitat. The construction-related losses would be considered a permanent removal of the habitats directly affected. The majority of seasonally inundated floodplain restoration is expected to occur along the lower San Joaquin River in the south and central Delta areas. This activity is scheduled to start following construction of water conveyance facilities, which is expected to take 10 years.
- *CM6 Channel Margin Enhancement:* Channel margin habitat enhancement could result in filling of small amounts of tidal freshwater emergent wetland habitat along 20 miles of river and sloughs. The extent of this loss cannot be quantified at this time, but the majority of the enhancement activity would occur on narrow strips of habitat, including levees and channel banks. The improvements would occur within the study area on sections of the Sacramento, San Joaquin and Mokelumne Rivers, and along Steamboat and Sutter Sloughs.

The following paragraphs summarize the combined effects discussed above and describe other BDCP conservation actions that offset or avoid these effects. NEPA and CEQA impact conclusions are also included.

Near-Term Timeframe

During the near-term timeframe (the first 10 years of BDCP implementation), Alternative 4 would affect the tidal freshwater emergent wetland natural community through CM1 construction losses (6 acres permanent and 5 acres temporary), CM2 construction losses (6 acres permanent), and CM4 construction losses (3 acres permanent). These losses would occur in the north Delta near Hood, in the central Delta on the fringes of Bacon and Woodward Islands, and in various locations within the Yolo Bypass and the tidal restoration ROAs.

The construction losses of this special-status natural community would represent an adverse effect if they were not offset by avoidance and minimization measures and restoration actions associated with BDCP conservation components. Loss of tidal freshwater emergent wetland natural community would be considered both a loss in acreage of a sensitive natural community and a loss of wetland as defined by Section 404 of the CWA. However, the creation of 5,200 acres of tidal freshwater emergent wetland natural community as part of CM4 during the first 10 years of BDCP implementation would more than offset this near-term loss, avoiding any adverse effect. This conclusion would be true with either of the two transmission line alignments being considered for Alternative 4. Typical project-level mitigation ratios (1:1 for restoration) would indicate that 20 acres of restoration would be needed to offset (i.e., mitigate for) the 20 acres of loss.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training*, *AMM2 Construction Best Management Practices and Monitoring*, *AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan*, *AMM7 Barge Operations Plan*, and *AMM10 Restoration of Temporarily Affected Natural Communities*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats at work areas and disposal sites. The AMMs are described in detail in BDCP Appendix 3.C.

Late Long-Term Timeframe

Implementation of Alternative 4 as a whole would result in relatively minor (less than 1%) losses of tidal freshwater emergent wetland community in the study area. These losses (16 acres of permanent and 6 acres of temporary loss) would be largely associated with construction of the water conveyance facilities (CM1), construction of Yolo Bypass fish improvements (CM2), and levee modification and land grading associated with tidal marsh restoration (CM4) and floodplain restoration (CM5). The CM4 and CM5 losses would occur over the 40-year life of the CM4 and CM5 conservation actions at various tidal and floodplain restoration sites throughout the study area. By the end of the Plan timeframe, a total of 13,900 acres of this natural community would be restored. The restoration would occur over a wide region of the study area, including within the Suisun Marsh, Cosumnes/Mokelumne, Cache Creek, and South Delta ROAs (see Figure 12-1). Therefore, Alternative 4 would not result in a net long-term reduction in the acreage of a sensitive natural community and would not have an adverse effect on this natural community; the effect would be beneficial.

CEQA Conclusion:

Near-Term Timeframe

Alternative 4 would result in the loss of approximately 20 acres of tidal freshwater emergent wetland natural community due to construction of the water conveyance facilities (CM1) and fish passage improvements (CM2), tidal marsh restoration (CM4), and floodplain restoration (CM5). The construction losses would occur in both the north Delta near Hood, in the central Delta on the fringes of Bacon and Victoria Islands, and in the Yolo Bypass and various tidal restoration ROAs. The losses would be spread across a 10-year near-term timeframe and would be offset by planned restoration of 5,200 acres of tidal freshwater emergent wetland natural community scheduled for the first 10 years of BDCP implementation (CM4). AMM1, AMM2, AMM6, AMM7 and AMM10 would also be implemented to minimize impacts. Because of these offsetting near-term restoration activities and AMMs, impacts would be less than significant. This conclusion would be true with either of the two transmission line alignments being considered for Alternative 4. Typical project-level mitigation ratios (1:1 for restoration) would indicate that 20 acres of restoration would be needed to offset (i.e., mitigate for) the 20 acres of loss. The restoration would be initiated at the beginning of Plan implementation to minimize any time lag in the availability of this habitat to special-status species, and would result in a net gain in acreage of this sensitive natural community.

Late Long-Term Timeframe

At the end of the Plan period, 22 acres of this community would be lost to conservation activities and 13,900 acres of this community would be restored. There would be no net permanent reduction in the acreage of this sensitive natural community within the study area. Therefore, Alternative 4 would not have a substantial adverse effect on this natural community; the impact on the tidal freshwater emergent wetland natural community would be beneficial.

Impact BIO-7: Increased frequency and duration of periodic inundation of tidal freshwater emergent wetland natural community

Two Alternative 4 conservation measures would modify the inundation/flooding regimes of both natural and man-made waterways in the study area. CM2, which is designed to improve fish passage and shallow flooded habitat for Delta fishes in the Yolo Bypass, would increase periodic flooding of tidal freshwater emergent wetland natural community on small acreages, while CM5 would expose this community to additional flooding as channel margins are modified and levees are set back to improve fish habitat along some of the major rivers and waterways throughout the study area.

- *CM2 Yolo Bypass Fisheries Enhancement*: Operation of the Yolo Bypass under Alternative 4 would result in an increase in the frequency and duration of inundation of 24–58 acres of tidal freshwater emergent wetland natural community. The area more frequently inundated would vary with the flow regime eventually selected at the newly-constructed notch in the Fremont Weir. Most of this community occurs in the southern section of the bypass on Liberty Island, on the fringes of tidal perennial aquatic habitats. Smaller areas are scattered among the cropland within the bypass, south of Interstate 80. The anticipated change in management of flows in the Yolo Bypass includes more frequent releases in flows into the bypass from the Fremont and Sacramento Weirs, and in some years, later releases into the bypass in spring months. The modification of periodic flood events would not adversely affect the ecological function of tidal freshwater emergent wetland habitats. The extended flooding would be designed to expand foraging and spawning habitat for Delta fishes. The tidal freshwater emergent wetland natural community would provide some of this expanded foraging habitat to fish species.
- *CM5 Seasonally Inundated Floodplain Restoration*: Floodplain restoration would result in an increase in the frequency and duration of inundation of 3 acres of tidal freshwater emergent wetland habitats. Specific locations for this restoration activity have not been identified, but they would likely be focused in the south Delta area, along the major rivers and Delta channels. The reconnection of these wetlands to stream flooding events would be beneficial to their ecological function, especially as they relate to BDCP target terrestrial and aquatic species. Foraging activity and refuge sites would be expanded into areas currently unavailable or infrequently available to some aquatic species.

In summary, 27–61 acres of tidal freshwater emergent wetland natural community in the study area would be subjected to more frequent inundation from flood flows as a result of implementing two Alternative 4 conservation measures (CM2 and CM5). Tidal freshwater emergent wetland natural community is a habitat of great value to both terrestrial and aquatic species in the study area; periodic inundation would not result in a net permanent reduction in the acreage of this community in the study area. Therefore, there would be no adverse effect.

CEQA Conclusion: An estimated 27–61 acres of tidal freshwater emergent wetland natural community in the study area would be subjected to more frequent inundation from flood flows as a result of implementing CM2 and CM5 under Alternative 4. This community is of great value to aquatic and terrestrial species in the study area. The periodic inundation would not result in a net permanent reduction in the acreage of this community in the study area. Therefore, there would be a less-than-significant impact on the tidal freshwater emergent wetland natural community.

Impact BIO-8: Modification of tidal freshwater emergent wetland natural community from ongoing operation, maintenance and management activities

Once the physical facilities associated with BDCP Alternative 4 are constructed and the stream flow regime associated with changed water management is in effect, there would be new ongoing and periodic actions associated with operation, maintenance and management of the BDCP facilities and conservation lands that could affect tidal freshwater emergent wetland natural community in the study area. The ongoing actions would include modified operation of upstream reservoirs, the diversion of Sacramento River flows in the north Delta, and reduced diversions from south Delta channels. These actions are associated with CM1 (see Impact BIO-7 for effects associated with CM2). The periodic actions would involve access road and conveyance facility repair, vegetation management at the various water conveyance facilities and habitat restoration sites (CM13), levee repair and replacement of levee armoring, channel dredging, and habitat enhancement in accordance with natural community management plans. The potential effects of these actions are described below.

- *Modified river flows upstream of and within the study area and reduced diversions from south Delta channels.* Changes in releases from reservoirs upstream of the study area, increased diversion of Sacramento River flows in the north Delta, and reduced diversion from south Delta channels would not result in the permanent reduction in acreage of a sensitive natural community in the study area. Flow levels in the upstream rivers would not change such that the acreage of tidal freshwater emergent wetland natural community would be reduced on a permanent basis. Increased diversions of Sacramento River flows in the north Delta would not result in a permanent reduction in this community downstream of these diversions. Tidal influence on water levels in the Sacramento River and Delta waterways would continue to be dominant. Reduced diversions from the south Delta channels would not create a reduction in this natural community.
- *Access road, water conveyance facility and levee repair.* Periodic repair of access roads, water conveyance facilities and levees associated with the BDCP actions have the potential to require removal of adjacent vegetation and could entail earth and rock work in or adjacent to tidal freshwater emergent wetland habitats. This activity could lead to increased soil erosion, turbidity and runoff entering tidal aquatic habitats. These activities would be subject to normal erosion, turbidity and runoff control management practices, including those developed as part of *AMM2 Construction Best Management Practices and Monitoring* and *AMM4 Erosion and Sediment*

Control Plan. Any vegetation removal or earthwork adjacent to or within emergent wetland habitats would require use of sediment and turbidity barriers, soil stabilization and revegetation of disturbed surfaces. Proper implementation of these measures would avoid permanent adverse effects on this community.

- *Vegetation management.* Vegetation management, in the form of physical removal and chemical treatment, would be a periodic activity associated with the long-term maintenance of water conveyance facilities and restoration sites. Vegetation management is also the principal activity associated with *CM13 Invasive Aquatic Vegetation Control.* Use of herbicides to control nuisance vegetation could pose a long-term hazard to tidal freshwater emergent wetland natural community at or adjacent to treated areas. The hazard could be created by uncontrolled drift of herbicides, uncontrolled runoff of contaminated stormwater onto the natural community, or direct discharge of herbicides to tidal aquatic areas being treated for invasive species removal. This risk is also discussed in Chapter 24, *Hazards and Hazardous Materials,* as Impact HAZ-6. Environmental commitments and *AMM5 Spill Prevention, Containment, and Countermeasure Plan* have been made part of the BDCP to reduce hazards to humans and the environment from use of various chemicals during maintenance activities, including the use of herbicides. These commitments are described in Appendix 3B, including the commitment to prepare and implement spill prevention and control plans and stormwater pollution prevention plans. Best management practices, including control of drift and runoff from treated areas, and use of herbicides approved for use in aquatic environments would also reduce the risk of affecting natural communities adjacent to water conveyance features and levees associated with restoration activities.

  Herbicides to remove aquatic invasive species as part of CM13 would be used to restore the normal ecological function of tidal aquatic habitats in planned restoration areas. The treatment activities would be conducted in concert with the California Department of Boating and Waterways' invasive species removal program. Eliminating large stands of water hyacinth and Brazilian waterweed would improve habitat conditions for some aquatic species by removing cover for nonnative predators, improving water flow and removing barriers to movement (see Chapter 11). These habitat changes should also benefit terrestrial species that use tidal freshwater emergent wetland natural community for cover and for foraging. Vegetation management effects on individual species are discussed in the species sections on following pages.

- *Channel dredging.* Long-term operation of the Alternative 4 intakes on the Sacramento River would include periodic dredging of sediments that might accumulate in front of intake screens. The dredging would occur in waterways adjacent to tidal freshwater emergent wetlands and would result in short-term increases in turbidity and disturbance of the substrate. These conditions would not eliminate the community, but would diminish its value for special-status and common species that rely on it for cover or foraging area. The individual species effects are discussed later in this chapter.

- *Habitat enhancement.* The BDCP includes a long-term management element for the natural communities within the Plan Area (CM11). For tidal freshwater emergent wetland community, a management plan would be prepared that specifies actions to improve the value of the habitats for covered species. Actions would include control of invasive nonnative plant and animal species, fire management, restrictions on vector control and application of herbicides, and maintenance of infrastructure that would allow for movement through the community. The enhancement efforts would improve the long-term value of this community for both special-status and common species.

The various operations and maintenance activities described above could alter acreage of tidal freshwater emergent wetland natural community in the study area through changes in flow patterns and changes in periodic inundation of this community. Activities could also introduce sediment and herbicides that would reduce the value of this community to common and sensitive plant and wildlife species. Other periodic activities associated with the Plan, including management, protection and enhancement actions associated with *CM3 Natural Communities Protection and Restoration* and *CM11 Natural Communities Enhancement and Management*, would be undertaken to enhance the value of the community. While some of these activities could result in small changes in acreage, these changes would be greatly offset by restoration activities planned as part of *CM4 Tidal Natural Communities Restoration*. The management actions associated with levee repair, periodic dredging and control of invasive plant species would also result in a long-term benefit to the species associated with tidal freshwater emergent wetland habitats by improving water movement. Ongoing operation, maintenance and management activities would not result in a net permanent reduction in this sensitive natural community within the study area. Therefore, there would be no adverse effect on the tidal freshwater emergent wetland natural community.

CEQA Conclusion: The operation and maintenance activities associated with Alternative 4 would have the potential to create minor changes in total acreage of tidal freshwater emergent wetland natural community in the study area, and could create temporary increases in turbidity and sedimentation. The activities could also introduce herbicides periodically to control nonnative, invasive plants. Implementation of environmental commitments and AMM2, AMM4, and AMM5 would minimize these impacts, and other operations and maintenance activities, including management, protection and enhancement actions associated with *CM3 Natural Communities Protection and Restoration* and *CM11 Natural Communities Enhancement and Management*, would create positive effects, including improved water movement in these habitats. Long-term restoration activities associated with *CM4 Tidal Natural Communities Restoration* would greatly expand this natural community in the study area. Ongoing operation, maintenance and management activities would not result in a net permanent reduction in this sensitive natural community within the study area. Therefore, there would be a less-than-significant impact on the tidal freshwater emergent wetland natural community.

Valley/Foothill Riparian

Construction, operation, maintenance and management associated with the conservation components of Alternative 4 would have no long-term adverse effects on the habitats associated with the valley/foothill riparian natural community. Initial development and construction of CM1, CM2, CM4, CM5, and CM6 would result in both permanent and temporary removal of this community. However, establishing natural community protection (CM3) and implementing natural community restoration (CM7) and management (CM11) would expand and improve valley/foothill riparian habitats in the study area (see Table 12-4-4).

Table 12-4-4. Changes in Valley/Foothill Riparian Natural Community Associated with Alternative 4 (acres)[a]

Habitat Affected[c]	Conservation Measure[b]	Permanent		Temporary		Periodic[d]	
		NT	LLT	NT	LLT	Yolo	Floodplain

CM1	49	49	25	25		
CM2	229	229	149	149	51–92	
CM4	298	552				
CM5		43		35		265
CM6	Unk.	Unk.	Unk.	Unk.	Unk.	Unk.
TOTAL IMPACTS	**576**	**873**	**174**	**209**	**51–92**	**265**
Habitat Restored/Created[e]	800	5,000				
Habitat Protected[e]	750	750				

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late long-term timeframes.

[b] See discussion below for a description of applicable CMs.

[c] LLT acreages are a summation of effects that would occur in the near-term, early long-term and late long-term timeframes. The LLT acreages represent the total amount of habitat that would be affected over the 50-year life of the BDCP and do not reflect habitat increases that would result from restoration, creation and protection activities.

[d] Periodic effects were estimated for the late long-term only.

[e] Restored/created and protected habitat acreages represent planned conservation activities that would be implemented over the timeframes identified in the BDCP (see BDCP Chapter 3, *Conservation Strategy*, for specifics).

NT = near-term
LLT = late long-term
NA = not applicable
Unk. = unknown

Impact BIO-9: Changes in valley/foothill riparian natural community as a result of implementing BDCP conservation measures

Construction, land grading and habitat restoration activities that would accompany the implementation of CM1, CM2, CM4, CM5, and CM6 would permanently eliminate an estimated 873 acres and temporarily remove 209 acres of valley/foothill riparian natural community in the study area. These modifications represent approximately 6% of the 18,449 acres of the community that is mapped in the study area. The majority of the permanent and temporary losses would happen during the first 10 years of BDCP implementation, as water conveyance facilities are constructed and habitat restoration is initiated. Valley/foothill riparian protection (750 acres) and restoration (800 acres) would be initiated during the same period, which would begin to offset the losses. By the end of the Plan period, 5,000 acres of this natural community would be restored. The individual effects of each relevant conservation measure are addressed below. A summary statement of the combined impacts and NEPA and CEQA conclusions follows the individual conservation measure discussions.

- *CM1 Water Facilities and Operation:* Construction of the Alternative 4 water conveyance facilities would permanently remove 49 acres and temporarily remove 25 acres of valley/foothill riparian natural community. Much of the permanent loss would occur where Intakes 2 and 5 encroach on the Sacramento River's east bank between Freeport and Courtland. The riparian areas here are very small patches, some dominated by valley oak and others by nonnative trees and scrub vegetation (see Terrestrial Biology Mapbook). Smaller areas dominated by blackberry would be eliminated at the forebay site adjacent to Clifton Court Forebay and patches of willow and blackberry would be lost along the transmission line corridors where they cross waterways in the central and south Delta. Temporary losses would occur where pipelines cross Snodgrass Slough and other small waterways east of the Sacramento River, and where temporary work areas surround intake sites and barge offloading facilities. The riparian habitat in these areas is also composed of very small patches or stringers bordering waterways, which are composed of valley oak, willow and scrub vegetation. These losses would take place during the near-term construction period.

There would be a 3-acre increase in both temporary and permanent losses of valley/foothill riparian natural community associated with constructing the east-west transmission line for the Alternative 4 water conveyance facilities rather than the north-south transmission line. This increase would be associated with construction through a large riparian forest along the Cosumnes River, in the Cosumnes River Preserve at the end of Lambert Road, east of Interstate 5.

- *CM2 Yolo Bypass Fisheries Enhancement:* Implementation of CM2 involves a number of construction activities within the Yolo and Sacramento Bypasses, including Fremont Weir and stilling basin improvements, Putah Creek realignment activities, Lisbon Weir modification and Sacramento Weir improvements. All of these activities could involve excavation and grading in valley/foothill riparian areas to improve passage of fish through the bypasses. Based on hypothetical construction footprints, a total of 229 acres could be permanently lost and another 149 acres could be temporarily removed. Most of the riparian losses would occur at the north end of Yolo Bypass where major fish passage improvements are planned. This vegetation is a mix of valley oak, cottonwood and willow trees. Excavation to improve water movement in the Toe Drain and in the Sacramento Weir would remove similar vegetation. These losses would occur primarily in the near-term timeframe.
- *CM4 Tidal Natural Communities Restoration:* Based on the use of hypothetical restoration footprints, implementation of CM4 would permanently inundate or remove 552 acres of valley/foothill riparian community. The losses would be spread among most of the ROAs established for tidal restoration (see Figure 12-1). No losses would occur from Suisun Marsh restoration. These ROAs support a mix of riparian vegetation types, including valley oak stands, extensive willow and cottonwood stringers along waterways, and areas of scrub vegetation dominated by blackberry.
- *CM5 Seasonally Inundated Floodplain Restoration:* Floodplain restoration levee construction would permanently remove 43 acres and temporarily remove 35 acres of valley/foothill riparian natural community. The construction-related losses would be considered a permanent removal of the habitats directly affected. These losses would be expected to occur along the San Joaquin River and other major waterways in CZ 7 (see Figure 12-1). This activity is scheduled to start following construction of water conveyance facilities, which is expected to take 10 years.
- *CM6 Channel Margin Enhancement:* Channel margin habitat enhancement could result in removal of small amounts of valley/foothill riparian habitat along 20 miles of river and sloughs. The extent of this loss cannot be quantified at this time, but the majority of the enhancement activity would occur along waterway margins where riparian habitat stringers exist, including levees and channel banks. The improvements would occur within the study area on sections of the Sacramento, San Joaquin and Mokelumne Rivers, and along Steamboat and Sutter Sloughs.
- *CM7 Riparian Natural Community Restoration:* The valley/foothill riparian natural community would be restored primarily in association with the tidal (CM4) and floodplain (CM5) restoration and channel margin enhancements. Following community-specific goals and

objectives in the Plan, a total of 5,000 acres of this community would be restored and 750 acres would be protected over the life of the Plan. Approximately 800 acres would be restored and the entire 750 acres would be protected in the first 10 years of Plan implementation. Riparian restoration and protection would be focused in CZ 4 and CZ 7, with a goal of adding a 500-acre portion of the restoration in one or the other of these zones. A variety of successional stages would also be sought to benefit the variety of sensitive plant and animal species that rely on this natural community in the study area.

The following paragraphs summarize the combined effects discussed above and describe other BDCP conservation actions that offset or avoid these effects. NEPA and CEQA impact conclusions are also included.

Near-Term Timeframe

During the near-term timeframe (the first 10 years of BDCP implementation), Alternative 4 would affect the valley/foothill riparian natural community through CM1 construction losses (49 acres permanent and 25 acres temporary) and the CM2 construction losses (229 acres permanent and 149 acres temporary). These losses would occur primarily along the eastern bank of the Sacramento River at intake sites, along pipeline routes connecting these intakes to the forebay, along transmission lines in the central and south Delta, or in the northern Yolo Bypass. Approximately 298 acres of the inundation and construction-related loss from CM4 would occur in the near-term. These losses would occur throughout the ROAs mapped in Figure 12-1.

The construction losses of this special-status natural community would represent an adverse effect if they were not offset by avoidance and minimization measures and protection/restoration actions associated with BDCP conservation components. Loss of valley/foothill riparian natural community would be considered a loss in acreage of a sensitive natural community, and could be considered a loss of wetlands as defined in Section 404 of the CWA. However, the restoration of 800 acres and protection (including significant enhancement) of 750 acres of valley/foothill riparian natural community as part of CM7 during the first 10 years of BDCP implementation would minimize this near-term loss, avoiding any adverse effect. Typical project-level mitigation ratios (1:1 for restoration and 1:1 for protection) would indicate that 750 acres of protection and 750 acres of restoration would be needed to offset (i.e., mitigate for) the 750 acres of loss. The combination of the two approaches (protection and restoration) are designed to avoid a temporal lag in the value of riparian habitat available to sensitive species.

The offsetting acreage would need to be 756 acres if the east-west transmission line alignment was selected for Alternative 4. Mitigation Measure BIO-9 would reduce the impact on valley/foothill riparian natural community by rerouting the eastern end of the transmission line alignment. Mitigation Measure BIO-9 is described below.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training*, *AMM2 Construction Best Management Practices and Monitoring*, *AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan*, *AMM7 Barge Operations Plan*, and *AMM10 Restoration of Temporarily Affected Natural Communities*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats at work areas and disposal sites. The AMMs are described in detail in BDCP Appendix 3.C.

Late Long-Term Timeframe

Implementation of Alternative 4 as a whole would result in relatively minor (6%) losses of valley/foothill riparian natural community in the study area. These losses (873 acres of permanent and 209 acres of temporary loss) would be largely associated with construction of the water conveyance facilities (CM1), construction of Yolo Bypass fish improvements (CM2), and inundation during tidal marsh restoration (CM4). Inundation losses would occur over the 40-year life of the Plan's restoration program, at various tidal restoration sites throughout the study area. By the end of the Plan timeframe, a total of 5,000 acres of this natural community would be restored and 750 acres would be protected (CM7 and CM3, respectively), primarily in CZ 4 and CZ 7 in the Cosumnes/Mokelumne and South Delta ROAs (see Figure 12-1). Therefore, Alternative 4 would not result in a net long-term reduction in the acreage of a sensitive natural community and would not have an adverse effect on the valley/foothill riparian natural community; the effect would be beneficial.

CEQA Conclusion:

Near-Term Timeframe

Alternative 4 would result in the loss of approximately 750 acres of valley/foothill riparian natural community due to construction of the water conveyance facilities (CM1) and fish passage improvements (CM2), and inundation during tidal marsh restoration (CM4). The construction losses would occur primarily along the Sacramento River at intake sites, along pipeline routes connecting these intakes to the forebay, along transmission corridors in the central and south Delta, and within the northern section of the Yolo Bypass, while inundation losses would occur at various tidal restoration sites throughout the study area. The construction losses would be spread across a 10-year near-term timeframe. These losses would be minimized by planned restoration of 800 acres (CM7) and protection (including significant enhancement) of 750 acres (CM3) of valley/foothill riparian natural community scheduled for the first 10 years of BDCP implementation (CM7). AMM1, AMM2, AMM6, AMM7, and AMM10 would also be implemented to minimize impacts. Because of these near-term restoration and protection activities and AMMs, impacts would be less than significant. Typical project-level mitigation ratios (1:1 for protection and 1:1 for restoration) would indicate that 750 acres of protection and 750 acres of restoration would be needed to offset (i.e., mitigate for) the 750 acres of loss. The combination of the two approaches (protection and restoration) are designed to avoid a temporal lag in the value of riparian habitat available to sensitive species. The restoration would be initiated at the beginning of Plan implementation to minimize any time lag in the availability of this habitat to special-status species, and would result in a net gain in acreage of this sensitive natural community.

The offsetting acreage would need to be 756 acres if the east-west transmission line alignment was selected for Alternative 4. It would be highly desirable to reroute the eastern end of this alignment to avoid crossing the riparian reserve along the Cosumnes River. See Mitigation Measure BIO-9 below regarding this transmission line reroute.

Late Long-Term Timeframe

At the end of the Plan period, 1,082 acres of valley/foothill riparian natural community would be permanently or temporarily removed by conservation actions, 5,000 acres would be restored and 750 acres would be protected. There would be no net permanent reduction in the acreage of this sensitive natural community within the study area. Therefore, Alternative 4 would not have a substantial adverse effect on this natural community; the impact would be beneficial.

Mitigation Measure BIO-9: Avoid construction through the Cosumnes River riparian corridor with east-west transmission line

To avoid removing a large segment of the Cosumnes River riparian corridor during construction of the eastern end of the east-west transmission line alignment, the alignment will be modified to cross the agricultural land to the west of the riparian corridor. Alternately, the transmission line will be designed to span the corridor such that the riparian forest will remain intact.

Impact BIO-10: Increased frequency and duration of periodic inundation of valley/foothill riparian natural community

Two Alternative 4 conservation measures would modify the inundation/flooding regimes of both natural and man-made waterways in the study area. CM2, which is designed to improve fish passage and shallow flooded habitat for Delta fishes in the Yolo Bypass, would increase periodic flooding of valley/foothill riparian natural community at scattered locations, while CM5 would expose this community to additional flooding as channel margins are modified and levees are set back to improve fish habitat along some of the major rivers and waterways of the study area.

- *CM2 Yolo Bypass Fisheries Enhancement:* Operation of the Yolo Bypass under Alternative 4 would result in an increase in the frequency and duration of inundation of 51–92 acres of valley/foothill riparian natural community. The area more frequently inundated would vary with the flow regime eventually selected at the newly-constructed notch in the Fremont Weir. The valley/foothill riparian community occurs throughout the bypass, including a large acreage just below Fremont Weir in the north end of the bypass. There are other riparian habitat areas on Liberty Island, and, to a lesser extent, along the eastern and western edges of the bypass, including along the Tule Canal/Toe Drain, the west side channels and the Sacramento Bypass. The anticipated change in management of flows in the Yolo Bypass includes more frequent releases in flows into the bypass from the Fremont and Sacramento Weirs, and in some years, later releases into the bypass in spring months. The modification of periodic flood events would not adversely affect riparian habitats, as they have persisted under similar high flows and extended flow periods. There would be a beneficial effect on the ecological function of valley/foothill riparian habitat in the bypass, especially as it relates to germination and establishment of native riparian plants.
- *CM5 Seasonally Inundated Floodplain Restoration:* Floodplain restoration would result in an increase in the frequency and duration of inundation of 265 acres of valley/foothill riparian habitats. Specific locations for this restoration activity have not been identified, but they would likely be focused in the south Delta area, along the major rivers and Delta channels in CZ 7 (see Figure 12-1). The reconnection of riparian vegetation to periodic stream flooding events would be beneficial to the ecological function of this natural community, especially in the germination and establishment of native riparian plants.

In summary, 316–367 acres of valley/foothill riparian community in the study area would be subjected to more frequent inundation from flood flows as a result of implementing two Alternative 4 conservation measures (CM2 and CM5). The valley/foothill riparian community is conditioned to and benefits from periodic inundation from flood flows; therefore, periodic inundation would not result in a net permanent reduction in the acreage of this community in the study area. The increased inundation would create a beneficial effect on the community as it relates to germination and establishment of native riparian plants. Increasing periodic flooding of valley/foothill riparian natural community in the Yolo Bypass and along south Delta waterways would have a beneficial effect on the community.

CEQA Conclusion: An estimated 316–367 acres of valley/foothill riparian community in the study area would be subjected to more frequent inundation from flood flows as a result of implementing CM2 and CM5 under Alternative 4. The valley/foothill riparian community is conditioned to and benefits from periodic inundation from flood flows; therefore, periodic inundation would not result in a net permanent reduction in the acreage of this community in the study area. Increasing periodic flooding of valley/foothill riparian natural community in the Yolo Bypass and along south Delta waterways would have a beneficial impact on the community.

Impact BIO-11: Modification of valley/foothill riparian natural community from ongoing operation, maintenance and management activities

Once the physical facilities associated with BDCP Alternative 4 are constructed and the stream flow regime associated with changed water management is in effect, there would be new ongoing and periodic actions associated with operation, maintenance and management of the BDCP facilities and conservation lands that could affect valley/foothill riparian natural community in the study area. The ongoing actions include modified operation of upstream reservoirs, the diversion of Sacramento River flows in the north Delta, and reduced diversions from south Delta channels. These actions are associated with CM1 (see Impact BIO-10 for effects associated with CM2). The periodic actions would involve access road and conveyance facility repair, vegetation management at the various water conveyance facilities and habitat restoration sites (CM13), levee repair and replacement of levee armoring, channel dredging, and habitat enhancement in accordance with natural community management plans. The potential effects of these actions are described below.

- *Modified operations and water levels in upstream reservoirs.* Modified operations and water levels at Shasta Lake, Lake Oroville, Whiskeytown Lake, Lewiston Lake, and Folsom Lake would not affect valley/foothill riparian natural community. The anticipated changes in water levels over time with Alternative 4, as compared to no action, would be 5–8% lower in the October to May timeframe. The small changes in frequency of higher water levels in these lakes would not substantially reduce the small patches of riparian vegetation that occupy the upper fringes of the reservoir pools. Changes in operations that would influence downstream river flows are discussed below.
- *Modified river flows upstream of and within the study area and reduced diversions from south Delta channels.* Changes in releases from reservoirs upstream of the study area, increased diversion of Sacramento River flows in the north Delta, and reduced diversion from south Delta channels would not result in the permanent reduction in acreage of valley/foothill riparian natural community in the study area. Flow levels in the upstream rivers would not change such that the acreage of this community would be reduced on a permanent basis. Similarly, increased diversions of Sacramento River flows in the north Delta would not result in a permanent reduction in valley/foothill riparian community downstream of these diversions. Tidal influence on water levels in the Sacramento River and Delta waterways would continue to be dominant. Reduced diversions from the south Delta channels would not create a reduction in this natural community.
- *Access road, water conveyance facility and levee repair.* Periodic repair of access roads, water conveyance facilities and levees associated with the BDCP actions have the potential to require removal of adjacent vegetation and could entail earth and rock work in valley/foothill riparian

habitats. This activity could lead to increased soil erosion, turbidity and runoff entering these habitats. These activities would be subject to normal erosion, turbidity and runoff control management practices, including those developed as part of *AMM2 Construction Best Management Practices and Monitoring* and *AMM4 Erosion and Sediment Control Plan.* Any vegetation removal or earthwork adjacent to or within riparian habitats would require use of sediment barriers, soil stabilization and revegetation of disturbed surfaces (*AMM10 Restoration of Temporarily Affected Natural Communities*). Proper implementation of these measures would avoid permanent adverse effects on this community.

- *Vegetation management.* Vegetation management, in the form of physical removal and chemical treatment, would be a periodic activity associated with the long-term maintenance of water conveyance facilities and restoration sites. Vegetation management is also the principal activity associated with *CM13 Invasive Aquatic Vegetation Control.* Use of herbicides to control nuisance vegetation could pose a long-term hazard to valley/foothill riparian natural community at or adjacent to treated areas. The hazard could be created by uncontrolled drift of herbicides, uncontrolled runoff of contaminated stormwater onto the natural community, or direct discharge of herbicides to riparian areas being treated for invasive species removal. This risk is also discussed in Chapter 24, *Hazards and Hazardous Materials,* as Impact HAZ-6. Environmental commitments and *AMM5 Spill Prevention, Containment, and Countermeasure Plan* have been made part of the BDCP to reduce hazards to humans and the environment from use of various chemicals during maintenance activities, including the use of herbicides. These commitments are described in Appendix 3B, including the commitment to prepare and implement spill prevention and control plans and stormwater pollution prevention plans. Best management practices, including control of drift and runoff from treated areas, and use of herbicides approved for use in terrestrial environments would also reduce the risk of affecting natural communities adjacent to water conveyance features and levees associated with restoration activities.

- *Channel dredging.* Long-term operation of the Alternative 4 intakes on the Sacramento River would include periodic dredging of sediments that might accumulate in front of intake screens. The dredging could occur adjacent to valley/foothill riparian natural community. This activity should not adversely affect riparian plants as long as dredging equipment is kept out of riparian areas and dredge spoil is disposed of outside of riparian corridors.

- *Habitat enhancement.* The BDCP includes a long-term management element for the natural communities within the Plan Area (CM11). For the valley/foothill riparian natural community, a management plan would be prepared that specifies actions to improve the value of the habitats for covered species. Actions would include control of invasive nonnative plant and animal species, fire management, restrictions on vector control and application of herbicides, and maintenance of infrastructure that would allow for movement through the community. The enhancement efforts would improve the long-term value of this community for both special-status and common species.

The various operations and maintenance activities described above could alter acreage of valley/foothill riparian natural community in the study area through changes in flow patterns and changes in periodic inundation of this community. Activities could also introduce sediment and herbicides that would reduce the value of this community to common and sensitive plant and wildlife species. Other periodic activities associated with the Plan, including management, protection and enhancement actions associated with *CM3 Natural Communities Protection and Restoration* and

CM11 Natural Communities Enhancement and Management, would be undertaken to enhance the value of the community. While some of these activities could result in small changes in acreage, these changes would be greatly offset by restoration and protection activities planned as part of *CM7 Riparian Natural Community Restoration* and *CM3 Natural Communities Protection and Restoration*, or minimized by implementation of AMM2, AMM4, AMM5, and AMM10. The management actions associated with levee repair, periodic dredging and control of invasive plant species would also result in a long-term benefit to the species associated with riparian habitats by improving water movement in adjacent waterways and by eliminating competitive, invasive species of plants. Ongoing operation, maintenance and management activities would not result in a net permanent reduction in this sensitive natural community within the study area. Therefore, there would be no adverse effect on the valley/foothill riparian natural community.

CEQA Conclusion: The operation and maintenance activities associated with Alternative 4 would have the potential to create minor changes in total acreage of valley/foothill riparian natural community in the study area, and could create temporary increases in turbidity and sedimentation. The activities could also introduce herbicides periodically to control nonnative, invasive plants. Implementation of environmental commitments and AMM2, AMM4, AMM5, and AMM10 would minimize these impacts, and other operations and maintenance activities, including management, protection and enhancement actions associated with *CM3 Natural Communities Protection and Restoration* and *CM11 Natural Communities Enhancement and Management*, would create positive effects, including reduced competition from invasive, nonnative plants in these habitats. Long-term restoration and protection activities associated with *CM7 Riparian Natural Community Restoration* and *CM3 Natural Communities Protection and Restoration* would greatly expand this natural community in the study area. Ongoing operation, maintenance and management activities would not result in a net permanent reduction in this sensitive natural community within the study area. Therefore, there would be a less-than-significant impact on the valley/foothill riparian natural community.

Nontidal Perennial Aquatic

Construction, operation, maintenance and management associated with the conservation components of Alternative 4 would have no long-term adverse effects on the habitats associated with the nontidal perennial aquatic natural community. Initial development and construction of CM1, CM2, CM4, CM5, and CM6 would result in both permanent and temporary removal of this community. However, establishing natural community protection (CM3) and implementing natural community restoration (CM10) and management (CM11) would expand and improve nontidal perennial aquatic habitat in the study area (see Table 12-4-5).

Table 12-4-5. Changes in Nontidal Perennial Aquatic Natural Community Associated with Alternative 4 (acres)[a]

Habitat Affected[c]	Conservation Measure[b]	Permanent		Temporary		Periodic[d]	
		NT	LLT	NT	LLT	Yolo	Floodplain
	CM1	12	12	9	9		
	CM2	34	34	10	10	54–80	
	CM4	34	189				
	CM5		28		16		25
	CM6	Unk.	Unk.	Unk.	Unk.	Unk.	Unk.

	TOTAL IMPACTS	**80**	**253**	**19**	**35**	**54–80**	**25**
Habitat Restored/Created[e]		400	1,200				
Habitat Protected[e]		35	50				

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late long-term timeframes.

[b] See discussion below for a description of applicable CMs.

[c] LLT acreages are a summation of effects that would occur in the near-term, early long-term and late long-term timeframes. The LLT acreages represent the total amount of habitat that would be affected over the 50-year life of the BDCP and do not reflect habitat increases that would result from restoration, creation and protection activities.

[d] Periodic effects were estimated for the late long-term only.

[e] Restored/created and protected habitat acreages represent planned conservation activities that would be implemented over the timeframes identified in the BDCP (see BDCP Chapter 3, *Conservation Strategy*, for specifics).

NT = near-term
LLT = late long-term
NA = not applicable
Unk. = unknown

Impact BIO-12: Changes in nontidal perennial aquatic natural community as a result of implementing BDCP conservation measures

Construction and land grading activities that would accompany the implementation of CM1, CM2, CM4, CM5, and CM6 would permanently eliminate an estimated 253 acres and temporarily remove 35 acres of nontidal perennial aquatic natural community in the study area. These modifications represent approximately 4% of the 5,587 acres of the community that is mapped in the study area. Approximately one-third (99 acres) of the permanent and temporary losses would happen during the first 10 years of BDCP implementation, as water conveyance facilities are constructed and habitat restoration is initiated. Natural communities restoration would add 400 acres of nontidal marsh during the same period, which would greatly expand the area of that habitat and offset the losses (thereby making them not adverse under NEPA and less than significant under CEQA). The nontidal marsh restoration would include a mosaic of nontidal perennial aquatic and nontidal freshwater perennial emergent wetland natural communities. The individual effects of each relevant conservation measure are addressed below. A summary statement of the combined impacts and NEPA and CEQA conclusions follows the individual conservation measure discussions.

- *CM1 Water Facilities and Operation*: Construction of the Alternative 4 water conveyance facilities would permanently remove 12 acres and temporarily remove 9 acres of nontidal perennial aquatic community. Most of the permanent loss would occur along the north-south transmission corridor in the central and south Delta (see Terrestrial Biology Mapbook). Most of the temporary loss would occur where temporary access roads would be constructed on Mandeville and Bouldin Islands. These wetlands are small ponds, stringers and ditches adjacent to farming roads. These losses would take place during the near-term construction period.

  The acreage of nontidal perennial aquatic community that would be lost to water conveyance construction would decrease by 4 acres (2 acres permanent and 2 acres temporary) if the east-west transmission corridor were used rather than the north-south corridor.

- *CM2 Yolo Bypass Fisheries Enhancement*: Implementation of CM2 involves a number of construction activities within the Yolo and Sacramento Bypasses, including Fremont Weir and stilling basin improvements, west side channels modifications, Putah Creek realignment activities, Lisbon Weir modification and Sacramento Weir improvements. All of these activities could involve excavation and grading in nontidal perennial aquatic areas to improve passage of fish through the bypasses. Based on hypothetical construction footprints, a total of 34 acres could be permanently lost and another 10 acres could be temporarily removed. This activity would occur primarily in the near-term timeframe.
- *CM4 Tidal Natural Communities Restoration*: Based on the use of hypothetical restoration footprints, implementation of CM4 would permanently change to tidally-influenced inundation or remove 189 acres of nontidal perennial aquatic community. These losses would be expected to occur primarily in the Cache Slough and Cosumnes/Mokelumne ROAs (see Figure 12-1). An estimated 1,200 acres of nontidal marsh would be restored and 50 acres would be protected during tidal habitat restoration. Approximately 400 acres of the restoration and 35 acres of the protection would happen during the first 10 years of BDCP implementation, which would coincide with the timeframe of water conveyance facilities construction. The remaining restoration would be spread over the following 30 years. Nontidal natural communities restoration is expected to be focused in the ROAs identified in Figure 12-1, including the lower Yolo Bypass, the South Delta, the Cosumnes/Mokelumne and the West Delta ROAs.
- *CM5 Seasonally Inundated Floodplain Restoration*: Based on theoretical footprints, floodplain restoration levee construction would permanently remove 28 acres and temporarily remove 16 acres of nontidal perennial aquatic habitat. The construction-related losses would be considered a permanent removal of the nontidal perennial aquatic habitats directly affected. It is expected that floodplain restoration would be focused on the south part of the Plan Area, in CZ 7. This activity is scheduled to start following construction of water conveyance facilities, which is expected to take 10 years.
- *CM6 Channel Margin Enhancement*: Channel margin habitat enhancement could result in filling of small amounts of nontidal perennial aquatic habitat along 20 miles of river and sloughs. The extent of this loss cannot be quantified at this time, but the majority of the enhancement activity would occur on the edges of tidal perennial aquatic habitat, including levees and channel banks. Nontidal marsh adjacent to these tidal areas could be affected. The improvements would be undertaken within the study area on sections of the Sacramento, San Joaquin and Mokelumne Rivers, and along Steamboat and Sutter Sloughs.

The following paragraphs summarize the combined effects discussed above and describe other BDCP conservation actions that offset or avoid these effects. NEPA and CEQA impact conclusions are also included.

Near-Term Timeframe

During the near-term timeframe (the first 10 years of BDCP implementation), Alternative 4 would affect the nontidal perennial aquatic community through CM1 construction losses (12 acres permanent and 9 acres temporary) and the CM2 construction losses (34 acres permanent and 10 acres temporary). These losses would occur primarily at scattered locations along the north-south transmission corridor and along access roads adjacent to the tunnel route in the central Delta. Approximately 34 acres of the inundation and construction-related losses from CM4 would occur in the near-term throughout several of the ROAs mapped in Figure 12-1.

The construction losses of this special-status natural community would represent an adverse effect if they were not offset by avoidance and minimization measures and restoration actions associated with BDCP conservation components. Loss of nontidal perennial aquatic natural community would be considered both a loss in acreage of a sensitive natural community and a loss of waters of the United States as defined by Section 404 of the CWA. However, the creation of 400 acres and protection of 35 acres of nontidal marsh as part of CM3 and CM10 during the first 10 years of BDCP implementation would more than offset this near-term loss, avoiding any adverse effect. Typical project-level mitigation ratios (1:1 for restoration and 1:1 for protection) would indicate 99 acres of restoration and 99 acres of protection would be needed to offset (i.e., mitigate for) the 99 acres of loss.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training*, *AMM2 Construction Best Management Practices and Monitoring*, *AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan*, *AMM7 Barge Operations Plan*, and *AMM10 Restoration of Temporarily Affected Natural Communities*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats at work areas and disposal sites. The AMMs are described in detail in BDCP Appendix 3.C.

The offsetting acreage would need to be 95 acres if the east-west transmission line alignment was selected for Alternative 4.

Late Long-Term Timeframe

Implementation of Alternative 4 as a whole would result in relatively minor (4%) losses of nontidal perennial aquatic community in the study area. These losses (253 acres of permanent and 35 acres of temporary loss) would be largely associated with construction of the water conveyance facilities (CM1), construction of Yolo Bypass fish improvements (CM2), and change to tidally-influenced inundation during tidal marsh restoration (CM4). The changes to tidally-influenced inundation would occur over the 40-year life of the CM4 restoration activities at various tidal restoration sites throughout the study area. By the end of the Plan timeframe, a total of 1,200 acres of nontidal marsh would be restored and 50 acres would be protected. The restoration would occur over a wide region of the study area, including within the Cosumnes/Mokelumne, Yolo Bypass, South Delta and East Delta ROAs (see Figure 12-1). Therefore, Alternative 4 would not result in a net long-term reduction in the acreage of a sensitive natural community and would not have an adverse effect on the nontidal perennial aquatic natural community; the effect would be beneficial.

CEQA Conclusion:

Near-Term Timeframe

Alternative 4 would result in the loss of approximately 99 acres of nontidal perennial aquatic natural community due to construction of the water conveyance facilities (CM1) and fish passage improvements (CM2), and change to tidally-influenced inundation during tidal marsh restoration (CM4). The construction losses would occur at scattered locations along the north-south transmission corridor and along access roads adjacent to the tunnel route in the central Delta. The losses would be spread across a 10-year near-term timeframe. These losses would be offset by planned restoration of 400 acres and protection of 35 acres of nontidal perennial aquatic natural community scheduled for the first 10 years of BDCP implementation (CM3 and CM10). AMM1, AMM2, AMM6, AMM7, and AMM10 would also be implemented to minimize impacts. Because of these offsetting near-term restoration activities and AMMs, impacts would be less than significant. This conclusion would be true with either of the two transmission line alignments being considered for Alternative 4. Typical project-level mitigation ratios (1:1 for restoration and 1:1 for protection) would indicate that 99 acres of restoration and 99 acres of protection would be needed to offset (i.e., mitigate for) the 99 acres of loss. The restoration and protection would be initiated at the beginning of Plan implementation to minimize any time lag in the availability of this habitat to special-status species, and would result in a net gain in acreage of this sensitive natural community.

Late Long-Term Timeframe

At the end of the Plan period, 288 acres of the natural community would be removed and 1,200 acres of this community would be restored. There would be no net permanent reduction in the acreage of this sensitive natural community within the study area. Therefore, Alternative 4 would not have a substantial adverse effect on the nontidal perennial aquatic natural community; the impact would be beneficial.

Impact BIO-13: Increased frequency and duration of periodic inundation of nontidal perennial aquatic natural community

Two Alternative 4 conservation measures would modify the inundation/flooding regimes of both natural and man-made waterways in the study area. CM2, which is designed to improve fish passage and shallow flooded habitat for Delta fishes in the Yolo Bypass, would increase periodic flooding of nontidal perennial aquatic natural community on small acreages, while CM5 would expose this community to additional flooding as channel margins are modified and levees are set back to improve fish habitat along some of the major rivers and waterways throughout the study area.

- *CM2 Yolo Bypass Fisheries Enhancement*: Operation of the Yolo Bypass under Alternative 4 would result in an increase in the frequency and duration of inundation of 54–80 acres of nontidal perennial aquatic natural community. The area more frequently inundated would vary with the flow regime eventually selected at the newly-constructed notch in the Fremont Weir. This community occurs in small stringers and patches throughout the bypass, including along the Tule Canal/Toe Drain, the western channels north of Interstate 80, and below the Fremont and Sacramento Weirs. The anticipated change in management of flows in the Yolo Bypass includes more frequent releases in flows into the bypass from the Fremont and Sacramento Weirs, and in some years, later releases into the bypass in spring months. The modification of periodic flood events would not adversely affect this natural community because its habitats in the Yolo Bypass have developed under a long-term regime of periodic flooding events. The extended flooding would be designed to expand foraging and spawning habitat for Delta fishes.
- *CM5 Seasonally Inundated Floodplain Restoration*: Floodplain restoration would result in an increase in the frequency and duration of inundation of an estimated 25 acres of nontidal perennial aquatic habitat. Specific locations for this restoration activity have not been identified, but they would likely be focused in the south Delta area, along the major rivers and Delta channels. The reconnection of these wetlands to stream flooding events would be beneficial to the ecological function of nontidal perennial aquatic habitats, especially as they relate to BDCP target aquatic species. Foraging activity and refuge sites would be expanded into areas currently unavailable or infrequently available to some aquatic species.

In summary, 79–105 acres of nontidal perennial aquatic community in the study area would be subjected to more frequent inundation from flood flows as a result of implementing two Alternative 4 conservation measures (CM2 and CM5). Nontidal perennial aquatic community would not be adversely affected because its habitats in the Yolo Bypass have developed under a long-term regime of periodic flooding events and inundation along expanded river floodplains would be infrequent. This increased inundation would create a beneficial effect on the nontidal perennial aquatic community as it relates to aquatic species use because the expanded foraging and spawning habitat that would be created would be of great value to aquatic species in the study area.

CEQA Conclusion: An estimated 79–105 acres of nontidal perennial aquatic community in the study area would be subjected to more frequent inundation from flood flows as a result of implementing CM2 and CM5 under Alternative 4. The nontidal perennial aquatic community would not be significantly impacted because its habitats in the Yolo Bypass have developed under a long-term regime of periodic flooding events and inundation along expanded river floodplains would be infrequent. The periodic inundation would not result in a net permanent reduction in the acreage of this community in the study area. Therefore, there would be no substantial adverse effect on the community. The impact would be less than significant.

Impact BIO-14: Modification of nontidal perennial aquatic natural community from ongoing operation, maintenance and management activities

Once the physical facilities associated with BDCP Alternative 4 are constructed and the stream flow regime associated with changed water management is in effect, there would be new ongoing and periodic actions associated with operation, maintenance and management of the BDCP facilities and conservation lands that could affect nontidal perennial aquatic natural community in the study area. The ongoing actions include modified operation of upstream reservoirs, the diversion of Sacramento River flows in the north Delta, and reduced diversions from south Delta channels. These actions are associated with CM1 (see Impact BIO-13 for effects associated with CM2). The periodic actions would involve access road and conveyance facility repair, vegetation management at the various water conveyance facilities and habitat restoration sites (CM13), levee repair and replacement of levee armoring, channel dredging, and habitat enhancement in accordance with natural community management plans. The potential effects of these actions are described below.

- *Modified operations and water levels in upstream reservoirs.* Modified operations and water levels at Shasta Lake, Lake Oroville, Whiskeytown Lake, Lewiston Lake, and Folsom Lake would affect nontidal perennial aquatic natural community, in the form of the reservoir pools. The Alternative 4 operations scheme would alter the surface elevations of these reservoir pools as described in Chapter 6, *Surface Water*. These fluctuations would occur within historic ranges and would not adversely affect the natural community. Changes in operations that would influence downstream river flows are discussed below.
- *Modified river flows upstream of and within the study area and reduced diversions from south Delta channels.* Changes in releases from reservoirs upstream of the study area, increased diversion of Sacramento River flows in the north Delta, and reduced diversion from south Delta channels would not result in the permanent reduction in acreage of the nontidal perennial aquatic natural community in the study area. Flow levels in the upstream rivers would not change such that the acreage of nontidal perennial aquatic community would be reduced on a permanent basis. Some minor increases and some decreases would be expected to occur along the major rivers during some seasons and in some water-year types, but there would be no permanent loss. Similarly, increased diversions of Sacramento River flows in the north Delta would not result in a permanent reduction in nontidal perennial aquatic community downstream of these diversions. Nontidal wetlands below the diversions are not directly connected to the rivers, as this reach of the river is tidally influenced. Reduced diversions from south Delta channels would not create a reduction in this natural community.

- *Access road, water conveyance facility and levee repair.* Periodic repair of access roads, water conveyance facilities and levees associated with the BDCP actions have the potential to require removal of adjacent vegetation and could entail earth and rock work in nontidal perennial aquatic habitats. This activity could lead to increased soil erosion, turbidity and runoff entering nontidal perennial aquatic habitats. These activities would be subject to normal erosion, turbidity and runoff control management practices, including those developed as part of *AMM2 Construction Best Management Practices and Monitoring* and *AMM4 Erosion and Sediment Control Plan.* Any vegetation removal or earthwork adjacent to or within aquatic habitats would require use of sediment and turbidity barriers, soil stabilization and revegetation of disturbed surfaces. Proper implementation of these measures would avoid permanent adverse effects on this community.

- *Vegetation management.* Vegetation management, in the form of physical removal and chemical treatment, would be a periodic activity associated with the long-term maintenance of water conveyance facilities and restoration sites. Vegetation management is also the principal activity associated with *CM13 Invasive Aquatic Vegetation Control.* Use of herbicides to control nuisance vegetation could pose a long-term hazard to nontidal perennial aquatic natural community at or adjacent to treated areas. The hazard could be created by uncontrolled drift of herbicides, uncontrolled runoff of contaminated stormwater onto the natural community, or direct discharge of herbicides to nontidal perennial aquatic areas being treated for invasive species removal. This risk is also discussed in Chapter 24, *Hazards and Hazardous Materials,* as Impact HAZ-6. Environmental commitments and *AMM5 Spill Prevention, Containment, and Countermeasure Plan* have been made part of the BDCP to reduce hazards to humans and the environment from use of various chemicals during maintenance activities, including the use of herbicides. These commitments are described in Appendix 3B, including the commitment to prepare and implement spill prevention and control plans and stormwater pollution prevention plans. Best management practices, including control of drift and runoff from treated areas, and use of herbicides approved for use in aquatic environments would also reduce the risk of affecting natural communities adjacent to water conveyance features and levees associated with restoration activities.

  Herbicides to remove aquatic invasive species as part of CM13 would be used to restore the normal ecological function of tidal and nontidal aquatic habitats in planned restoration areas. The treatment activities would be conducted in concert with the California Department of Boating and Waterways' invasive species removal program. Eliminating large stands of water hyacinth and Brazilian waterweed would improve habitat conditions for some aquatic species by removing cover for nonnative predators, improving water flow and removing barriers to movement (see Chapter 11, *Fish and Aquatic Resources*). These habitat changes should also benefit terrestrial species that use tidal and nontidal perennial aquatic natural community for movement corridors and for foraging. Vegetation management effects on individual species are discussed in the species sections on following pages.

- *Habitat enhancement.* The BDCP includes a long-term management element for the natural communities within the Plan Area (CM11). For nontidal perennial aquatic natural community, a management plan would be prepared that specifies actions to improve the value of the habitats for covered species. Actions would include control of invasive nonnative plant and animal species, fire management, restrictions on vector control and application of herbicides, and maintenance of infrastructure that would allow for movement through the community. The enhancement efforts would improve the long-term value of this community for both special-status and common species.

The various operations and maintenance activities described above could alter acreage of nontidal perennial aquatic natural community in the study area through changes in flow patterns and changes in periodic inundation of this community. Activities could also introduce sediment and herbicides that would reduce the value of this community to common and sensitive plant and wildlife species. Other periodic activities associated with the Plan, including management, protection and enhancement actions associated with *CM3 Natural Communities Protection and Restoration* and *CM11 Natural Communities Enhancement and Management*, would be undertaken to enhance the value of the community. While some of these activities could result in small changes in acreage, these changes would be greatly offset by restoration activities planned as part of *CM4 Tidal Natural Communities Restoration* and protection actions associated with *CM3 Natural Communities Protection and Restoration*. The management actions associated with levee repair and control of invasive plant species would also result in a long-term benefit to the species associated with nontidal perennial aquatic habitats by improving water movement. Ongoing operation, maintenance and management activities would not result in a net permanent reduction in this sensitive natural community within the study area. Therefore, there would be no adverse effect on the nontidal perennial aquatic natural community.

CEQA Conclusion: The operation and maintenance activities associated with Alternative 4 would have the potential to create minor changes in total acreage of nontidal perennial aquatic natural community in the study area, and could create temporary increases in turbidity and sedimentation. The activities could also introduce herbicides periodically to control nonnative, invasive plants. Implementation of environmental commitments and AMM2, AMM4, and AMM5 would minimize these impacts, and other operations and maintenance activities, including management, protection and enhancement actions associated with *CM3 Natural Communities Protection and Restoration* and *CM11 Natural Communities Enhancement and Management*, would create positive effects, including improved water movement in these habitats. Long-term restoration activities associated with *CM4 Tidal Natural Communities Restoration* and protection actions associated with *CM3 Natural Communities Protection and Restoration* would greatly expand this natural community in the study area. Ongoing operation, maintenance and management activities would not result in a net permanent reduction in this sensitive natural community within the study area. Therefore, there would be a less-than-significant impact on the nontidal perennial aquatic natural community.

Nontidal Freshwater Perennial Emergent Wetland

Construction, operation, maintenance and management associated with the conservation components of Alternative 4 would have no long-term adverse effects on the habitats associated with the nontidal freshwater perennial emergent wetland natural community. Initial development and construction of CM1, CM2, CM4, CM5, and CM6 would result in both permanent and temporary removal of this community. However, establishing natural community protection (CM3) and implementing natural community restoration (CM10) and management (CM11) would expand and improve nontidal freshwater perennial emergent wetland habitats in the study area (see Table 12-4-6).

Table 12-4-6. Changes in Nontidal Freshwater Perennial Emergent Wetland Natural Community Associated with Alternative 4 (acres)[a]

Habitat Affected[c]

	Conservation Measure[b]	Permanent					
		NT	LLT	NT	LLT	Yolo	Floodplain
	CM1	1	1	1	1		
	CM2			1	1	24–58	
	CM4	38	97				
	CM5						8
	CM6	Unk.	Unk.	Unk.	Unk.	Unk.	Unk.
	TOTAL IMPACTS	**39**	**98**	**2**	**2**	**24–58**	**8**
Habitat Restored/Created[e]		400	1,200				
Habitat Protected[e]		35	50				

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late long-term timeframes.

[b] See discussion below for a description of applicable CMs.

[c] LLT acreages are a summation of effects that would occur in the near-term, early long-term and late long-term timeframes. The LLT acreages represent the total amount of habitat that would be affected over the 50-year life of the BDCP and do not reflect habitat increases that would result from restoration, creation and protection activities.

[d] Periodic effects were estimated for the late long-term only.

[e] Restored/created and protected habitat acreages represent planned conservation activities that would be implemented over the timeframes identified in the BDCP (see BDCP Chapter 3, *Conservation Strategy*, for specifics).

NT = near-term
LLT = late long-term
NA = not applicable
Unk. = unknown

Impact BIO-15: Changes in nontidal freshwater perennial emergent wetland natural community as a result of implementing BDCP conservation measures

Construction and land grading activities that would accompany the implementation of CM1, CM2, CM4, CM5, and CM6 would permanently eliminate an estimated 98 acres and temporarily remove 2 acres of nontidal freshwater perennial emergent wetland natural community in the study area. These modifications represent approximately 7% of the 1,369 acres of the community that is mapped in the study area. Approximately 40% (41 acres) of the permanent and temporary losses would happen during the first 10 years of BDCP implementation, as water conveyance facilities are constructed and habitat restoration is initiated. Natural communities restoration would add 400 acres of nontidal marsh during the same period, which would greatly expand the area of that habitat and offset the losses, thereby making them not adverse under NEPA and less than significant under CEQA. The nontidal marsh restoration would include a mosaic of nontidal perennial aquatic and nontidal freshwater perennial emergent wetland natural communities. The individual effects of each relevant conservation measure are addressed below. A summary statement of the combined impacts and NEPA and CEQA conclusions follows the individual conservation measure discussions.

- *CM1 Water Facilities and Operation:* Construction of the Alternative 4 water conveyance facilities would permanently remove 1 acre and temporarily remove 1 acre of tidal freshwater perennial emergent wetland community. The permanent loss would occur at the southern forebay construction site (see Terrestrial Biology Mapbook). The temporary loss would occur where a temporary access road would be constructed on Bouldin Island. These wetlands are extremely small and remote water bodies. These losses would take place during the near-term construction period.

The CM1 construction effects for Alternative 4 would be the same for this community, regardless of which transmission line corridor was selected.

- *CM2 Yolo Bypass Fisheries Enhancement*: Implementation of CM2 involves a number of construction activities within the Yolo and Sacramento Bypasses, including Fremont Weir and stilling basin improvements, west side channels modifications, Putah Creek realignment activities, Lisbon Weir modification and Sacramento Weir improvements. All of these activities could involve excavation and grading in nontidal freshwater perennial emergent wetland areas to improve passage of fish through the bypasses. Based on hypothetical construction footprints, a total of 1 acre could be temporarily removed. This activity would occur primarily in the near-term timeframe.
- *CM4 Tidal Natural Communities Restoration*: Based on the use of hypothetical restoration footprints, implementation of CM4 would permanently inundate or remove 97 acres of nontidal freshwater perennial emergent wetland community, primarily in the Cache Slough ROA (see Figure 12-1). An estimated 1,200 acres of nontidal marsh would be restored and 50 acres would be protected during tidal habitat restoration. Approximately 400 acres of the restoration and 35 acres of the protection would happen during the first 10 years of BDCP implementation, which would coincide with the timeframe of water conveyance facilities construction. The remaining restoration would be spread over the following 30 years. Nontidal natural communities restoration is expected to be focused in the ROAs identified in Figure 12-1, including the lower Cache Creek, South Delta, Cosumnes/Mokelumne and West Delta ROAs.
- *CM5 Seasonally Inundated Floodplain Restoration*: Based on theoretical footprints, floodplain restoration levee construction would not affect nontidal freshwater perennial emergent wetland natural community.
- *CM6 Channel Margin Enhancement*: Channel margin habitat enhancement could result in filling of small amounts of nontidal freshwater perennial emergent wetland habitat along 20 miles of river and sloughs. The extent of this loss cannot be quantified at this time, but the majority of the enhancement activity would occur on the edges of tidal perennial aquatic habitat, including levees and channel banks. Nontidal marsh adjacent to these tidal areas could be affected. The improvements would occur within the study area on sections of the Sacramento, San Joaquin and Mokelumne Rivers, and along Steamboat and Sutter Sloughs.

The following paragraphs summarize the combined effects discussed above and describe other BDCP conservation actions that offset or avoid these effects. NEPA and CEQA impact conclusions are also included.

Near-Term Timeframe

During the near-term timeframe (the first 10 years of BDCP implementation), Alternative 4 would affect the nontidal freshwater perennial emergent wetland community through CM1 construction losses (1 acre permanent and 1 acre temporary) and the CM2 construction losses (1 acre temporary). These losses would occur at the southern forebay, along temporary access roads in the central Delta, and in the Yolo Bypass. Approximately 38 acres of the inundation and construction-related losses from CM4 would occur in the near-term. These losses would occur throughout several of the ROAs mapped in Figure 12-1.

The construction losses of this special-status natural community would represent an adverse effect if they were not offset by avoidance and minimization measures and restoration actions associated with BDCP conservation components. Loss of nontidal freshwater perennial emergent wetland natural community would be considered both a loss in acreage of a sensitive natural community and a loss of wetland as defined by Section 404 of the CWA. However, the creation of 400 acres and protection of 35 acres of nontidal perennial marsh as part of CM3 and CM10 during the first 10 years of BDCP implementation would more than offset this near-term loss, avoiding any adverse effect. Typical project-level mitigation ratios (1:1 for restoration and 1:1 for protection) would indicate 41 acres of restoration and 41 acres of protection would be needed to offset (i.e., mitigate for) the 41 acres of loss.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training*, *AMM2 Construction Best Management Practices and Monitoring*, *AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan*, *AMM7 Barge Operations Plan* and *AMM10 Restoration of Temporarily Affected Natural Communities*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats at work areas and disposal sites. The AMMs are described in detail in BDCP Appendix 3.C.

Late Long-Term Timeframe

Implementation of Alternative 4 as a whole would result in small (8%) losses of nontidal freshwater perennial emergent wetland community in the study area. These losses (98 acres of permanent and 2 acres of temporary loss) would be largely associated with construction of the water conveyance facilities (CM1), construction of Yolo Bypass fish improvements (CM2), and inundation during tidal marsh restoration (CM4). Inundation losses would occur over the 40-year life of the CM4 restoration activities at various tidal restoration sites throughout the study area. By the end of the Plan timeframe, a total of 1,200 acres of nontidal marsh would be restored and 50 acres would be protected. The restoration would occur over a wide region of the study area, including within the Cosumnes/Mokelumne, Cache Creek, and South Delta ROAs (see Figure 12-1). Therefore, Alternative 4 would not result in a net long-term reduction in the acreage of a sensitive natural community and would not have an adverse effect on the nontidal freshwater perennial emergent wetland natural community; the effect would be beneficial.

CEQA Conclusion:

Near-Term Timeframe

Alternative 4 would result in the loss of approximately 41 acres of nontidal freshwater perennial emergent wetland natural community due to construction of the water conveyance facilities (CM1) and fish passage improvements (CM2), and inundation during tidal marsh restoration (CM4). The construction losses would occur at the southern forebay, along temporary access roads in the central Delta, and in the Yolo Bypass. Approximately 38 acres of the inundation and construction-related losses from CM4 would occur in the near-term. These losses would occur throughout several of the ROAs mapped in Figure 12-1.

The losses would be spread across a 10-year near-term timeframe. These losses would be offset by planned restoration of 400 acres and protection of 35 acres of nontidal marsh scheduled for the first 10 years of BDCP implementation (CM3 and CM10). AMM1, AMM2, AMM6, AMM7, and AMM10 would also be implemented to minimize impacts. Because of these offsetting near-term restoration activities and AMMs, impacts would be less than significant. This conclusion would be true with either of the two transmission line alignments being considered for Alternative 4. Typical project-level mitigation ratios (1:1 for restoration and 1:1 for protection) would indicate that 41 acres of restoration and 41 acres of protection would be needed to offset (i.e., mitigate for) the 41 acres of loss. The restoration and protection would be initiated at the beginning of Plan implementation to minimize any time lag in the availability of this habitat to special-status species, and would result in a net gain in acreage of this sensitive natural community.

Late Long-Term Timeframe

At the end of the Plan period, 100 acres of the natural community would be removed and 1,200 acres of nontidal marsh would be restored. There would be no net permanent reduction in the acreage of this sensitive natural community within the study area. Therefore, Alternative 4 would not have a substantial adverse effect on the nontidal freshwater perennial emergent wetland natural community; the impact would be beneficial.

Impact BIO-16: Increased frequency and duration of periodic inundation of nontidal freshwater perennial emergent wetland natural community

Two Alternative 4 conservation measures would modify the inundation/flooding regimes of both natural and man-made waterways in the study area. CM2, which is designed to improve fish passage and shallow flooded habitat for Delta fishes in the Yolo Bypass, would increase periodic flooding of nontidal freshwater perennial emergent wetland natural community on small acreages, while CM5 would expose this community to additional flooding as channel margins are modified and levees are set back to improve fish habitat along some of the major rivers and waterways throughout the study area.

- *CM2 Yolo Bypass Fisheries Enhancement*: Operation of the Yolo Bypass under Alternative 4 would result in an increase in the frequency and duration of inundation of 24–58 acres of nontidal freshwater perennial emergent wetland natural community. The area more frequently inundated would vary with the flow regime eventually selected at the newly-constructed notch in the Fremont Weir. This community occurs in small stringers and patches in the central and southern bypass. The anticipated change in management of flows in the Yolo Bypass includes more frequent releases in flows into the bypass from the Fremont and Sacramento Weirs, and in some years, later releases into the bypass in spring months. The modification of periodic flood events would not adversely affect this natural community because its habitats in the Yolo Bypass have developed under a long-term regime of periodic flooding events. The extended flooding would be designed to expand foraging and spawning habitat for Delta fishes.
- *CM5 Seasonally Inundated Floodplain Restoration*: Floodplain restoration would result in an increase in the frequency and duration of inundation of an estimated 8 acres of nontidal freshwater perennial emergent wetland habitat. Specific locations for this restoration activity have not been identified, but they would likely be focused in the south Delta area, along the major rivers and Delta channels. The reconnection of these wetlands to stream flooding events would be beneficial to the ecological function of nontidal freshwater perennial emergent wetland habitats, especially as they relate to BDCP target aquatic species. Foraging activity and refuge sites would be expanded into areas currently unavailable or infrequently available to some aquatic species.

In summary, from 32–66 acres of nontidal freshwater emergent perennial emergent wetland community in the study area would be subjected to more frequent inundation from flood flows as a result of implementing two Alternative 4 conservation measures (CM2 and CM5). This community would not be adversely affected because its habitats in the Yolo Bypass have developed under a long-term regime of periodic flooding events and inundation along expanded river floodplains would be infrequent. This increased inundation would create a beneficial effect on the nontidal freshwater perennial emergent wetland community as it relates to aquatic species use because the expanded foraging and spawning habitat that would be created would be of great value to aquatic species in the study area.

CEQA Conclusion: An estimated 32–66 acres of nontidal freshwater perennial emergent wetland community in the study area would be subjected to more frequent inundation from flood flows as a result of implementing CM2 and CM5 under Alternative 4. This community would not be significantly impacted because its habitats in the Yolo Bypass have developed under a long-term regime of periodic flooding events and inundation along expanded river floodplains would be infrequent. The periodic inundation would not result in a net permanent reduction in the acreage of this community in the study area. Therefore, there would be no substantial adverse effect on the community. The impact would be less than significant on the nontidal freshwater perennial emergent wetland natural community.

Impact BIO-17: Modification of nontidal freshwater perennial emergent wetland natural community from ongoing operation, maintenance and management activities

Once the physical facilities associated with BDCP Alternative 4 are constructed and the stream flow regime associated with changed water management is in effect, there would be new ongoing and periodic actions associated with operation, maintenance and management of the BDCP facilities and conservation lands that could affect nontidal freshwater perennial emergent wetland natural community in the study area. The ongoing actions include modified operation of upstream reservoirs, the diversion of Sacramento River flows in the north Delta, and reduced diversions from south Delta channels. These actions are associated with CM1 (see Impact BIO-16 for effects associated with CM2). The periodic actions would involve access road and conveyance facility repair, vegetation management at the various water conveyance facilities and habitat restoration sites (CM13), levee repair and replacement of levee armoring, channel dredging, and habitat enhancement in accordance with natural community management plans. The potential effects of these actions are described below.

- *Modified operations and water levels in upstream reservoirs.* Modified operations and water levels at Shasta Lake, Lake Oroville, Whiskeytown Lake, Lewiston Lake, and Folsom Lake would not affect the nontidal freshwater perennial emergent wetland natural community. These reservoirs do not support significant stands of freshwater emergent wetlands. Changes in operations that would influence downstream river flows are discussed below.
- *Modified river flows upstream of and within the study area and reduced diversions from south Delta channels.* Changes in releases from reservoirs upstream of the study area, increased diversion of Sacramento River flows in the north Delta, and reduced diversions from south Delta channels would not result in the permanent reduction in acreage of the nontidal freshwater perennial emergent wetland natural community in the study area. The majority of this wetland type exists outside of the levees of the larger rivers and would not be affected by flow changes in river or Delta channels. Similarly, increased diversions of Sacramento River flows in the north Delta would not result in a permanent reduction in nontidal freshwater perennial emergent wetland community downstream of these diversions. Nontidal wetlands below the diversions are not directly connected to the rivers, as this reach of the river is tidally influenced. Reduced diversions from south Delta channels would not create a reduction in this natural community.

- *Access road, water conveyance facility and levee repair.* Periodic repair of access roads, water conveyance facilities and levees associated with the BDCP actions have the potential to require removal of adjacent vegetation and could entail earth and rock work in nontidal freshwater perennial emergent wetland habitats. This activity could lead to increased soil erosion, turbidity and runoff entering nontidal freshwater perennial habitats. These activities would be subject to normal erosion, turbidity and runoff control management practices, including those developed as part of *AMM2 Construction Best Management Practices and Monitoring* and *AMM4 Erosion and Sediment Control Plan.* Any vegetation removal or earthwork adjacent to or within aquatic habitats would require use of sediment and turbidity barriers, soil stabilization and revegetation of disturbed surfaces. Proper implementation of these measures would avoid permanent adverse effects on this community.

- *Vegetation management.* Vegetation management, in the form of physical removal and chemical treatment, would be a periodic activity associated with the long-term maintenance of water conveyance facilities and restoration sites. Vegetation management is also the principal activity associated with *CM13 Invasive Aquatic Vegetation Control.* Use of herbicides to control nuisance vegetation could pose a long-term hazard to nontidal freshwater perennial emergent wetland natural community at or adjacent to treated areas. The hazard could be created by uncontrolled drift of herbicides, uncontrolled runoff of contaminated stormwater onto the natural community, or direct discharge of herbicides to nontidal perennial wetland areas being treated for invasive species removal. This risk is also discussed in Chapter 24, *Hazards and Hazardous Materials,* as Impact HAZ-6. Environmental commitments and *AMM5 Spill Prevention, Containment, and Countermeasure Plan* have been made part of the BDCP to reduce hazards to humans and the environment from use of various chemicals during maintenance activities, including the use of herbicides. These commitments are described in Appendix 3B, including the commitment to prepare and implement spill prevention and control plans and stormwater pollution prevention plans. Best management practices, including control of drift and runoff from treated areas, and use of herbicides approved for use in aquatic environments would also reduce the risk of affecting natural communities adjacent to water conveyance features and levees associated with restoration activities.

  Herbicides to remove aquatic invasive species as part of CM13 would be used to restore the normal ecological function of tidal and nontidal aquatic habitats in planned restoration areas. The treatment activities would be conducted in concert with the California Department of Boating and Waterways' invasive species removal program. Eliminating large stands of water hyacinth and Brazilian waterweed would improve habitat conditions for some aquatic species by removing cover for nonnative predators, improving water flow and removing barriers to movement (see Chapter 11, *Fish and Aquatic Resources*). These habitat changes should also benefit terrestrial species that use tidal and nontidal freshwater perennial emergent wetland natural community for movement corridors and for foraging. Vegetation management effects on individual species are discussed in the species sections on following pages.

- *Habitat enhancement.* The BDCP includes a long-term management element for the natural communities within the Plan Area (CM11). For nontidal freshwater perennial emergent wetland natural community, a management plan would be prepared that specifies actions to improve the value of the habitats for covered species. Actions would include control of invasive nonnative plant and animal species, fire management, restrictions on vector control and application of herbicides, and maintenance of infrastructure that would allow for movement through the community. The enhancement efforts would improve the long-term value of this community for both special-status and common species.

The various operations and maintenance activities described above could alter acreage of nontidal freshwater perennial emergent wetland natural community in the study area through changes in flow patterns and changes in periodic inundation of this community. Activities could also introduce sediment and herbicides that would reduce the value of this community to common and sensitive plant and wildlife species. Other periodic activities associated with the Plan, including management, protection and enhancement actions associated with *CM3 Natural Communities Protection and Restoration* and *CM11 Natural Communities Enhancement and Management*, would be undertaken to enhance the value of the community. While some of these activities could result in small changes in acreage, these changes would be greatly offset by restoration activities planned as part of *CM10 Nontidal Marsh Restoration* and protection actions associated with *CM3 Natural Communities Protection and Restoration*. The management actions associated with levee repair and control of invasive plant species would also result in a long-term benefit to the species associated with nontidal freshwater perennial emergent wetland habitats by improving water movement. Ongoing operation, maintenance and management activities would not result in a net permanent reduction in this sensitive natural community within the study area. Therefore, there would be no adverse effect on the nontidal freshwater perennial emergent wetland natural community.

CEQA Conclusion: The operation and maintenance activities associated with Alternative 4 would have the potential to create minor changes in total acreage of nontidal freshwater perennial emergent wetland natural community in the study area, and could create temporary increases in turbidity and sedimentation. The activities could also introduce herbicides periodically to control nonnative, invasive plants. Implementation of environmental commitments and AMM2, AMM4, and AMM5 would minimize these impacts, and other operations and maintenance activities, including management, protection and enhancement actions associated with *CM3 Natural Communities Protection and Restoration* and *CM11 Natural Communities Enhancement and Management*, would create positive effects, including improved water movement in and adjacent to these habitats. Long-term restoration activities associated with *CM10 Nontidal Marsh Restoration* and protection actions associated with *CM3 Natural Communities Protection and Restoration* would greatly expand this natural community in the study area. Ongoing operation, maintenance and management activities would not result in a net permanent reduction in this sensitive natural community within the study area. Therefore, there would be a less-than-significant impact on the nontidal freshwater perennial emergent wetland natural community.

Alkali Seasonal Wetland Complex

Construction, operation, maintenance and management associated with the conservation components of the BDCP would have no long-term adverse effects on the habitats associated with the alkali seasonal wetland complex natural community. Initial development and construction of CM2 and CM4 would result in permanent removal of this community. However, establishing natural community protection (CM3) and restoration (CM9) would expand and improve alkali seasonal wetland complex habitats in the study area (see Table 12-4-7).

Table 12-4-7. Changes in Alkali Seasonal Wetland Complex Natural Community Associated with Alternative 4 (acres)[a]

Habitat Affected[c]	Conservation Measure[b]	Permanent	Temporary	Periodic[d]

	NT	LLT	NT	LLT	Yolo	Floodplain
CM1						
CM2	45	45			264–744	
CM4	13	27				
CM5						
CM6	Unk.	Unk.	Unk.	Unk.	Unk.	Unk.
TOTAL IMPACTS	**58**	**72**			**264–744**	
Habitat Restored/Created[e]	58	72				
Habitat Protected[e]	120	150				

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late long-term timeframes.

[b] See discussion below for a description of applicable CMs.

[c] LLT acreages are for CM1, CM2, CM4, and CM5 are a summation of effects that would occur in the NT, early long-term and LLT timeframes. They represent the total loss of habitat that would occur over the 50-year life of the Plan. The LLT totals for these CMs do not reflect the increases in habitat that would occur with restoration and protection listed at the bottom of the table.

[d] Periodic effects were estimated for the late long-term only.

[e] Restored/created and protected habitat acreages represent planned conservation activities that would be implemented over the timeframes identified in the BDCP (see BDCP Chapter 3, *Conservation Strategy*, for specifics).

NT = near-term
LLT = late long-term
NA = not applicable
Unk. = unknown

Impact BIO-18: Changes in alkali seasonal wetland complex natural community as a result of implementing BDCP conservation measures

Construction, land grading and habitat restoration activities that would accompany the implementation of CM2 and CM4 under Alternative 4 would permanently eliminate an estimated 72 acres of alkali seasonal wetland complex natural community in the study area. These modifications represent approximately 2% of the 3,723 acres of the community that is mapped in the study area. Most of the losses (58 acres or 80%) would happen during the first 10 years of BDCP implementation, as Yolo Bypass improvements and habitat restoration is initiated. Alkali seasonal wetland complex protection (120 acres) and restoration (58 acres) would be initiated during the same period, which would offset the losses, thereby making them not adverse under NEPA and less than significant under CEQA. By the end of the Plan period, 150 acres of this natural community would be protected and 72 acres would be restored. The individual effects of each relevant conservation measure are addressed below. A summary statement of the combined impacts and NEPA and CEQA conclusions follows the individual conservation measure discussions.

- *CM1 Water Facilities and Operation:* Construction of the Alternative 4 water conveyance facilities would not affect alkali seasonal wetland complex natural community. This is true regardless of which transmission line corridor is selected for use.
- *CM2 Yolo Bypass Fisheries Enhancement:* Implementation of CM2 involves a number of construction activities within the Yolo and Sacramento Bypasses, including Fremont Weir and stilling basin improvements, Putah Creek realignment activities, Lisbon Weir modification and

Sacramento Weir improvements. Realignment of Putah Creek could involve excavation and grading in alkali seasonal wetland complex as a new channel is constructed. Based on hypothetical construction footprints, a total of 45 acres could be permanently lost. This complex is located immediately south of the existing Putah Creek channel within the bypass. This loss would occur in the near-term timeframe.

- *CM3 Natural Communities Protection and Restoration:* CM3 proposes to protect at least 150 acres of alkali seasonal wetland complex in CZ 1, CZ 8, and CZ 11. The protection would occur in areas containing a mosaic of grassland and vernal pool complex in unfragmented natural landscapes supporting a diversity of native plant and wildlife species. These areas would be both protected and enhanced to increase the cover of alkali seasonal wetland plants relative to nonnative species.
- *CM4 Tidal Natural Communities Restoration:* Based on the use of hypothetical restoration footprints, implementation of CM4 would permanently inundate or remove 13 acres of alkali seasonal wetland complex in the near-term and inundate or remove 27 acres by the end of the Plan timeframe. The losses would be expected to occur in the Cache Slough and Suisun Marsh ROAs established for tidal restoration (see Figure 12-1). The largest losses would likely occur in the south end of the Yolo Bypass and on the northern fringes of Suisun Marsh.
- *CM9 Vernal Pool and Alkali Seasonal Wetland Complex Restoration:* CM9 includes both vernal pool complex and alkali seasonal wetland complex restoration goals. The intent of the conservation measure is to match the acreage of restoration with the actual acreage lost to other conservation measures (primarily CM2 and CM4). The current estimate for alkali seasonal wetland complex restoration is 58 acres in the near-term and a total of 72 acres by the end of the Plan's 40-year restoration period. The goal is for no net loss of this natural community.

The following paragraphs summarize the combined effects discussed above and describe other BDCP conservation actions that offset or avoid these effects. NEPA and CEQA impact conclusions are also included.

Near-Term Timeframe

During the near-term timeframe (the first 10 years of BDCP implementation), Alternative 4 would affect the alkali seasonal wetland complex natural community through CM2 construction losses (45 acres). These losses would occur in the Yolo Bypass south of Putah Creek. Approximately 13 acres of the inundation and construction-related losses in habitat from CM4 would occur in the near-term. These losses would occur primarily in the Cache Slough and Suisun Marsh ROAs mapped in Figure 12-1.

The construction losses of this special-status natural community would represent an adverse effect if they were not offset by avoidance and minimization measures and restoration actions associated with BDCP conservation components. Loss of alkali seasonal wetland complex natural community would be considered both a loss in acreage of a sensitive natural community and a loss of wetland as defined by Section 404 of the CWA. However, the protection of 120 acres of alkali seasonal wetland complex as part of CM3 and the restoration of 58 acres of this community as part of CM9 during the first 10 years of BDCP implementation would offset this near-term loss, avoiding any adverse effect. Typical project-level mitigation ratios (2:1 for protection and 1:1 for restoration) would indicate 116 acres of protection and 58 acres of restoration would be needed to offset (i.e., mitigate for) the 58 acres of loss.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training*, *AMM2 Construction Best Management Practices and Monitoring*, *AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan*, *AMM7 Barge Operations Plan* and *AMM10 Restoration of Temporarily Affected Natural Communities*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats at work areas. The AMMs are described in detail in BDCP Appendix 3.C.

Late Long-Term Timeframe

Implementation of Alternative 4 as a whole would result in relatively minor (2%) losses of alkali seasonal wetland natural community in the study area. These losses (72 acres) would be largely associated with construction of Yolo Bypass fish improvements (CM2) and inundation during tidal marsh restoration (CM4). Inundation losses would occur over the 40-year life of the Plan's restoration activities, primarily in the Cache Slough and Suisun Marsh ROAs. By the end of the Plan timeframe, a total of 150 acres of this natural community would be protected (CM3) and 72 acres would be restored (CM9). The protection and restoration would occur primarily in CZ 1, CZ 8 and CZ 11, in the Cache Slough, Suisun Marsh and Clifton Court Forebay areas. Therefore, Alternative 4 would not have an adverse effect on the alkali seasonal wetland complex natural community.

CEQA Conclusion:

Near-Term Timeframe

Alternative 4 would result in the loss of approximately 58 acres of alkali seasonal wetland complex natural community due to construction of fish passage improvements (CM2) and inundation during tidal marsh restoration (CM4). The construction losses would occur primarily in the area just south of Putah Creek in the Yolo Bypass, while inundation losses would occur in the Cache Slough and Suisun Marsh ROAs. The losses would be spread across a 10-year near-term timeframe.

The construction losses of this special-status natural community would represent an adverse effect if they were not offset by avoidance and minimization measures and other actions associated with BDCP conservation components. Loss of alkali seasonal wetland complex natural community would be considered both a loss in acreage of a sensitive natural community and a loss of wetland as defined by Section 404 of the CWA. However, the protection of 120 acres of alkali seasonal wetland complex as part of CM3 and the restoration of 58 acres of this community as part of CM9 during the first 10 years of BDCP implementation would offset this near-term loss, avoiding any significant impact. Typical project-level mitigation ratios (2:1 for protection and 1:1 for restoration) would indicate 116 acres of protection and 58 acres or restoration would be needed to offset (i.e., mitigate for) the 58 acres of loss. AMM1, AMM2, AMM3, AMM4, and AMM10 would also be implemented to minimize impacts. Because of the offsetting protection and restoration activities and AMMs, impacts would be less than significant.

Late Long-Term Timeframe

At the end of the Plan period, 72 acres of alkali seasonal wetland complex natural community would be permanently removed by conservation actions, 150 acres would be protected and 72 acres would be restored. There would be no net permanent reduction in the acreage of this natural community within the study area. Therefore, Alternative 4 would have a less-than-significant impact on the alkali seasonal wetland complex natural community.

Impact BIO-19: Increased frequency and duration of periodic inundation of alkali seasonal wetland complex natural community

CM2 Yolo Bypass Fisheries Enhancement would modify the inundation/flooding regime of the Yolo Bypass, a man-made waterway. CM2, which is designed to improve fish passage and shallow flooded habitat for Delta fishes in the Yolo Bypass, would increase periodic flooding of alkali seasonal wetland complex natural community at scattered locations in the central and southern sections of the bypass.

Operation of the Yolo Bypass under Alternative 4 would result in an increase in the frequency and duration of inundation on an estimated 264–744 acres of alkali seasonal wetland complex natural community. The area more frequently inundated would vary with the flow regime eventually selected at the newly-constructed notch in the Fremont Weir. The alkali seasonal wetland complex natural community occurs primarily in the central and southern reaches of the bypass, south of Putah Creek. The anticipated change in management of flows in the Yolo Bypass includes more frequent releases in flows into the bypass from the Fremont and Sacramento Weirs, and in some years, later releases into the bypass in spring months. The modification of periodic flood events would not adversely affect alkali seasonal wetland complex habitats, as they have persisted under similar high flows and extended flow periods. There is the potential for some change in plant species composition as a result of longer inundation periods.

CEQA Conclusion: An estimated 264–744 acres of alkali seasonal wetland complex natural community in the Yolo Bypass would be subjected to more frequent inundation from flood flows as a result of implementing CM2 under Alternative 4. This natural community is conditioned to periodic inundation from flood flows; the slight increase in periodic inundation would not result in a net permanent reduction in the acreage of this community in the study area, although some change in plant species composition could occur. Increasing periodic flooding of alkali seasonal wetland complex natural community in the Yolo Bypass would have a less-than-significant impact on the alkali seasonal wetland complex natural community.

Impact BIO-20: Modification of alkali seasonal wetland complex natural community from ongoing operation, maintenance and management activities

Once the physical facilities associated with BDCP Alternative 4 are constructed and the stream flow regime associated with changed water management is in effect, there would be new ongoing and periodic actions associated with operation, maintenance and management of the BDCP facilities and conservation lands that could affect alkali seasonal wetland complex natural community in the study area. The ongoing actions include modified operation of upstream reservoirs, the diversion of Sacramento River flows in the north Delta, and reduced diversions from south Delta channels. These actions are associated with CM1 (see Impact BIO-19 for effects associated with CM2). The periodic actions would involve access road and conveyance facility repair, vegetation management at the various water conveyance facilities and habitat restoration sites (CM13), levee repair and replacement of levee armoring, channel dredging, and habitat enhancement in accordance with natural community management plans. The potential effects of these actions are described below.

- *Modified river flows upstream of and within the study area and reduced diversions from south Delta channels.* Changes in releases from reservoirs upstream of the study area, increased diversion of Sacramento River flows in the north Delta, and reduced diversions from south Delta channels would not affect alkali seasonal wetland natural community. This natural community does not exist within or adjacent to the major Sacramento River system and Delta waterways.

- *Access road, water conveyance facility and levee repair.* Periodic repair of access roads, water conveyance facilities and levees associated with the BDCP actions have the potential to require removal of adjacent vegetation and could entail earth and rock work in alkali seasonal wetland complex habitats. This activity could lead to increased soil erosion and runoff entering these habitats. These activities would be subject to normal erosion and runoff control management practices, including those developed as part of *AMM2 Construction Best Management Practices and Monitoring* and *AMM4 Erosion and Sediment Control Plan.* Any vegetation removal or earthwork adjacent to or within alkali seasonal wetland complex habitats would require use of sediment barriers, soil stabilization and revegetation of disturbed surfaces *AMM10 Restoration of Temporarily Affected Natural Communities*. Proper implementation of these measures would avoid permanent adverse effects on this community.

- *Vegetation management.* Vegetation management, in the form of physical removal and chemical treatment, would be a periodic activity associated with the long-term maintenance of water conveyance facilities and restoration sites. Vegetation management is also the principal activity associated with *CM13 Invasive Aquatic Vegetation Control.* Use of herbicides to control nuisance vegetation could pose a long-term hazard to alkali seasonal wetland complex natural community at or adjacent to treated areas. The hazard could be created by uncontrolled drift of herbicides, uncontrolled runoff of contaminated stormwater onto the natural community, or direct discharge of herbicides to alkali seasonal wetland complex areas being treated for invasive species removal. This risk is also discussed in Chapter 24, *Hazards and Hazardous Materials,* as Impact HAZ-6. Environmental commitments and *AMM5 Spill Prevention, Containment, and Countermeasure Plan* have been made part of the BDCP to reduce hazards to humans and the environment from use of various chemicals during maintenance activities, including the use of herbicides. These commitments are described in Appendix 3B, including the commitment to prepare and implement spill prevention and control plans and stormwater pollution prevention plans. Best management practices, including control of drift and runoff from treated areas, and use of herbicides approved for use in terrestrial environments would also reduce the risk of affecting natural communities adjacent to water conveyance features and levees associated with restoration activities.

- *Habitat enhancement.* The BDCP includes a long-term management element for the natural communities within the Plan Area (CM11). For the alkali seasonal wetland complex natural community, a management plan would be prepared that specifies actions to improve the value of the habitats for covered species. Actions would include control of invasive nonnative plant and animal species, fire management, restrictions on vector control and application of herbicides, and maintenance of infrastructure that would allow for movement through the community. The enhancement efforts would improve the long-term value of this community for both special-status and common species.

The various operations and maintenance activities described above could alter acreage of alkali seasonal wetland complex natural community in the study area. Activities could introduce sediment and herbicides that would reduce the value of this community to common and sensitive plant and wildlife species. Other periodic activities associated with the Plan, including management, protection and enhancement actions associated with *CM3 Natural Communities Protection and Restoration* and *CM11 Natural Communities Enhancement and Management*, would be undertaken to enhance the value of the community. While some of these activities could result in small changes in acreage, these changes would be greatly offset by restoration activities planned as part of *CM9 Vernal Pool and Alkali Seasonal Wetland Complex Restoration*, or minimized by implementation of AMM2, AMM4, AMM5, and AMM10. The management actions associated with control of invasive plant species would also result in a long-term benefit to the species associated with alkali seasonal wetland complex habitats by eliminating competitive, invasive species of plants. Ongoing operation, maintenance and management activities would not result in a net permanent reduction in this natural community within the study area. Therefore, there would be no adverse effect on the alkali seasonal wetland complex natural community.

CEQA Conclusion: The operation and maintenance activities associated with Alternative 4 would have the potential to create minor changes in total acreage of alkali seasonal wetland complex natural community in the study area, and could create temporary increases sedimentation. The activities could also introduce herbicides periodically to control nonnative, invasive plants. Implementation of environmental commitments and AMM2, AMM4, AMM5, and AMM10 would minimize these impacts, and other operations and maintenance activities, including management, protection and enhancement actions associated with *CM3 Natural Communities Protection and Restoration* and *CM11 Natural Communities Enhancement and Management*, would create positive effects, including reduced competition from invasive, nonnative plants in these habitats. Long-term restoration activities associated with *CM9 Vernal Pool and Alkali Seasonal Wetland Complex Restoration* and protection actions associated with *CM3 Natural Communities Protection and Restoration* would ensure that the acreage of this natural community would not decrease in the study area. Ongoing operation, maintenance and management activities would not result in a net permanent reduction in this natural community within the study area. Therefore, there would be a less-than-significant impact on the alkali seasonal wetland complex natural community.

Vernal Pool Complex

Construction, operation, maintenance and management associated with the conservation components of the BDCP would have no long-term adverse effects on the habitats associated with the vernal pool complex natural community. Initial development and construction of CM4 would result in permanent removal of 1 acre of this community. However, establishing natural community protection (CM3), restoration (CM9) and management (CM11) would expand and improve vernal pool complex habitats in the study area (see Table 12-4-8). If the east-west transmission line corridor were selected for this alternative, CM1 would result in an additional permanent loss of 1 acre of vernal pool complex natural community.

Table 12-4-8. Changes in Vernal Pool Complex Natural Community Associated with Alternative 4 (acres)[a]

Habitat Affected[c]	Conservation Measure[b]	Permanent		Temporary		Periodic[d]	
		NT	LLT	NT	LLT	Yolo	Floodplain
	CM1						
	CM2					0–4	
	CM4	1	1				
	CM5						
	CM6	Unk.	Unk.	Unk.	Unk.	Unk.	Unk.
	TOTAL IMPACTS	**1**	**1**			**0–4**	
Habitat Restored/Created[e]		40	67				
Habitat Protected[e]		400	600				

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late

long-term timeframes.

[b] See discussion below for a description of applicable CMs.

[c] LLT acreages are a summation of effects that would occur in the near-term, early long-term and late long-term timeframes. The LLT acreages represent the total amount of habitat that would be affected over the 50-year life of the BDCP and do not reflect habitat increases that would result from restoration, creation and protection activities.

[d] Periodic effects were estimated for the late long-term only.

[e] Restored/created and protected habitat acreages represent planned conservation activities that would be implemented over the timeframes identified in the BDCP (see BDCP Chapter 3, *Conservation Strategy*, for specifics).

NT = near-term
LLT = late long-term
NA = not applicable
Unk. = unknown

Impact BIO-21: Changes in vernal pool complex natural community as a result of implementing BDCP conservation measures

Construction, land grading and habitat restoration activities that would accompany the implementation of CM4 would permanently eliminate an estimated 1 acre of vernal pool complex natural community in the study area. This modification represents less than 1% of the 9,395 acres of the community that is mapped in the study area. This 1 acre loss would happen during the first 10 years of BDCP implementation, as tidal marsh restoration is initiated. Vernal pool complex protection (400 acres) and restoration (40 acres) would be initiated during the same period, which would offset the losses (thereby making them not adverse under NEPA and less than significant under CEQA). By the end of the Plan period, 600 acres of this natural community would be protected and 67 acres would be restored. The individual effects of the relevant conservation measure are addressed below. A summary statement of the combined impacts and NEPA and CEQA conclusions follows the individual conservation measure discussions.

- *CM1 Water Facilities and Operation:* Construction of the Alternative 4 water conveyance facilities would not directly affect vernal pool complex natural community if the north-south transmission line corridor were utilized. If the east-west transmission corridor was selected, 1 acre of this community would be lost where the corridor extends eastward across the Cosumnes River riparian corridor, within the Cosumnes River Preserve (see Figure 12-1 and the Terrestrial Biology Mapbook).
- *CM3 Natural Communities Protection and Restoration:* CM3 proposes to protect at least 600 acres of vernal pool complex in CZ 1, CZ 8, and CZ 11. The protection would occur in areas containing a mosaic of grassland and vernal pool complex in unfragmented natural landscapes supporting a diversity of native plant and wildlife species. These areas would be both protected and enhanced to increase the cover of vernal pool complex plants relative to nonnative species.
- *CM4 Tidal Natural Communities Restoration:* Based on the use of hypothetical restoration footprints, implementation of CM4 could permanently inundate or remove 1 acre of vernal pool complex in the near-term timeframe. The loss would be expected to occur in either the Cache Slough or Suisun Marsh ROAs established for tidal restoration (see Figure 12-1).
- *CM9 Vernal Pool and Alkali Seasonal Wetland Complex Restoration:* CM9 includes both vernal pool complex and alkali seasonal wetland complex restoration goals. The current estimate for

vernal pool complex restoration is 40 acres in the near-term and a total of 67 acres by the end of the Plan's 40-year restoration period. This restoration goal greatly exceeds the "no net loss" policy normally applied to this natural community.

The following paragraphs summarize the combined effects discussed above and describe other BDCP conservation actions that offset or avoid these effects. NEPA and CEQA impact conclusions are also included.

Near-Term Timeframe

During the near-term timeframe (the first 10 years of BDCP implementation), Alternative 4 would affect 1 acre of vernal pool complex natural community through inundation or construction-related losses in habitat from CM4 activities. This loss would likely occur in the Cache Slough or Suisun Marsh ROAs mapped in Figure 12-1.

The construction or inundation loss of this special-status natural community would represent an adverse effect if it were not offset by avoidance and minimization measures and restoration actions associated with BDCP conservation components. Loss of vernal pool complex natural community would be considered both a loss in acreage of a sensitive natural community and a loss of wetland as defined by Section 404 of the CWA. However, the protection of 400 acres of vernal pool complex as part of CM3 and the restoration of 40 acres of this community as part of CM9 during the first 10 years of BDCP implementation would offset this near-term loss, avoiding any adverse effect. Typical project-level mitigation ratios (2:1 for protection and 1:1 for restoration) would indicate 2 acres of protection and 1 acre of restoration would be needed to offset (i.e., mitigate for) the 1 acre of loss. The extensive protection and restoration would result in a beneficial effect on this natural community. The additional 1 acre loss associated with use of the east-west transmission line alignment would not change this conclusion.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training*, *AMM2 Construction Best Management Practices and Monitoring*, *AMM3 Stormwater Pollution Prevention Plan*, *AMM4 Erosion and Sediment Control Plan*, and *AMM10 Restoration of Temporarily Affected Natural Communities*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats at work areas. The AMMs are described in detail in BDCP Appendix 3.C.

Late Long-Term Timeframe

The late long-term effect on vernal pool complex natural community would be the same as described above for near-term. One acre could be lost, but 600 acres would be protected and 67 acres would be restored, creating a beneficial effect on the natural community.

CEQA Conclusion:

Near-Term Timeframe

Alternative 4 would result in the loss of approximately 1 acre of vernal pool complex natural community due to inundation during tidal marsh restoration (CM4). The loss would likely occur in the Cache Slough or Suisun Marsh ROAs. The loss would occur in the 10-year near-term timeframe.

The inundation loss of this special-status natural community would represent an adverse effect if it were not offset by avoidance and minimization measures and other actions associated with BDCP conservation components. Loss of vernal pool complex natural community would be considered both a loss in acreage of a sensitive natural community and a loss of wetland as defined by Section

404 of the CWA. However, the protection of 400 acres of vernal pool complex as part of CM3 and the restoration of 40 acres of this community as part of CM9 during the first 10 years of BDCP implementation would offset this near-term loss, avoiding any significant impact. Typical project-level mitigation ratios (2:1 for protection and 1:1 for restoration) would indicate 2 acres of protection and 1 acre of restoration would be needed to offset (i.e., mitigate) the 1 acre of loss. The additional 1 acre loss associated with use of the east-west transmission line alignment would not change this conclusion. AMM1, AMM2, AMM3, AMM4, and AMM10 would also be implemented to minimize impacts. Because of the offsetting protection and restoration activities and AMMs, impacts would be beneficial.

Late Long-Term Timeframe

At the end of the Plan period, 1 acre of vernal pool complex natural community would be permanently removed by conservation actions, 600 acres would be protected and 67 acres would be restored. There would be no net permanent reduction in the acreage of this natural community within the study area. There would be a significant expansion of the natural community. Therefore, Alternative 4 would have a beneficial impact on this natural community.

Impact BIO-22: Increased frequency and duration of periodic inundation of vernal pool complex natural community

CM2 Yolo Bypass Fisheries Enhancement would modify the inundation/flooding regime of the Yolo Bypass, a man-made waterway. CM2, which is designed to improve fish passage and shallow flooded habitat for Delta fishes in the Yolo Bypass, could increase periodic flooding of a small acreage of vernal pool complex natural community in the southern section of the bypass, south of Putah Creek.

Operation of the Yolo Bypass under Alternative 4 would result in an increase in the frequency and duration of inundation on an estimated 0–4 acres of vernal pool complex natural community. The area more frequently inundated would vary with the flow regime eventually selected at the newly-constructed notch in the Fremont Weir. The vernal pool complex natural community occurs primarily in the southern reaches of the bypass, south of Putah Creek. The anticipated change in management of flows in the Yolo Bypass includes more frequent releases in flows into the bypass from the Fremont and Sacramento Weirs, and in some years, later releases into the bypass in spring months. The modification of periodic flood events would not adversely affect vernal pool complex habitats, as they have persisted under similar high flows and extended flow periods. There is the potential, however, for some change in plant species composition as a result of longer inundation periods.

CEQA Conclusion: An estimated 0–4 acres of vernal pool complex natural community in the Yolo Bypass would be subjected to more frequent inundation from flood flows as a result of implementing CM2 under Alternative 4. This natural community is conditioned to periodic inundation from flood flows; the slight increase in periodic inundation would not result in a net permanent reduction in the acreage of this community in the study area, although some change in plant species composition could occur. Increasing periodic flooding of vernal pool complex natural community in the Yolo Bypass would have a less-than-significant impact on the community.

Impact BIO-23: Modification of vernal pool complex natural community from ongoing operation, maintenance and management activities

Once the physical facilities associated with BDCP Alternative 4 are constructed and the stream flow regime associated with changed water management is in effect, there would be new ongoing and periodic actions associated with operation, maintenance and management of the BDCP facilities and conservation lands that could affect vernal pool complex natural community in the study area. The ongoing actions include modified operation of upstream reservoirs, the diversion of Sacramento River flows in the north Delta, and reduced diversions from south Delta channels. These actions are associated with CM1 (see Impact BIO-22 for effects associated with CM2). The periodic actions would involve access road and conveyance facility repair, vegetation management at the various water conveyance facilities and habitat restoration sites (CM13), levee repair and replacement of levee armoring, channel dredging, and habitat enhancement in accordance with natural community management plans. The potential effects of these actions are described below.

- *Modified river flows upstream of and within the study area and reduced diversions from south Delta channels.* Changes in releases from reservoirs upstream of the study area, increased diversion of Sacramento River flows in the north Delta, and reduced diversions from south Delta channels would not affect vernal pool complex natural community. This natural community does not exist within or adjacent to the major Sacramento River system and Delta waterways.
- *Access road, water conveyance facility and levee repair.* Periodic repair of access roads, water conveyance facilities and levees associated with the BDCP actions have the potential to require removal of adjacent vegetation and could entail earth and rock work adjacent to vernal pool complex habitats. This activity could lead to increased soil erosion and runoff entering these habitats. These activities would be subject to normal erosion and runoff control management practices, including those developed as part of *AMM2 Construction Best Management Practices and Monitoring* and *AMM4 Erosion and Sediment Control Plan.* Any vegetation removal or earthwork adjacent to vernal pool complex habitats would require use of sediment barriers, soil stabilization and revegetation of disturbed surfaces as part of *AMM10 Restoration of Temporarily Affected Natural Communities*. Proper implementation of these measures would avoid permanent adverse effects on this community.
- *Vegetation management.* Vegetation management, in the form of physical removal and chemical treatment, would be a periodic activity associated with the long-term maintenance of water conveyance facilities and restoration sites. Vegetation management is also the principal activity associated with *CM13 Invasive Aquatic Vegetation Control.* Use of herbicides to control nuisance vegetation could pose a long-term hazard to vernal pool complex natural community at or adjacent to treated areas. The hazard could be created by uncontrolled drift of herbicides, uncontrolled runoff of contaminated stormwater onto the natural community, or direct discharge of herbicides to vernal pool complex areas being treated for invasive species removal. This risk is also discussed in Chapter 24, *Hazards and Hazardous Materials,* as Impact HAZ-6. Environmental commitments and *AMM5 Spill Prevention, Containment, and Countermeasure Plan* have been made part of the BDCP to reduce hazards to humans and the environment from use of various chemicals during maintenance activities, including the use of herbicides. These commitments are described in Appendix 3B, including the commitment to prepare and implement spill prevention and control plans and stormwater pollution prevention plans. Best management practices, including control of drift and runoff from treated areas, and use of herbicides approved for use in terrestrial or aquatic environments would also reduce the risk of affecting natural communities adjacent to water conveyance features and levees associated with restoration activities.

- *Habitat enhancement.* The BDCP includes a long-term management element for the natural communities within the Plan Area (CM11). For the vernal pool complex natural community, a management plan would be prepared that specifies actions to improve the value of the habitats for covered species. Actions would include control of invasive nonnative plant and animal species, fire management, restrictions on vector control and application of herbicides, and maintenance of infrastructure that would allow for movement through the community. The enhancement efforts would improve the long-term value of this community for both special-status and common species.

The various operations and maintenance activities described above could alter acreage of vernal pool complex natural community in the study area. Activities could introduce sediment and herbicides that would reduce the value of this community to common and sensitive plant and wildlife species. Other periodic activities associated with the Plan, including management, protection and enhancement actions associated with *CM3 Natural Communities Protection and Restoration* and *CM11 Natural Communities Enhancement and Management*, would be undertaken to enhance the value of the community. While some of these activities could result in small changes in acreage, these changes would be greatly offset by restoration activities planned as part of *CM9 Vernal Pool and Alkali Seasonal Wetland Complex Restoration*, or minimized by implementation of AMM2, AMM4, AMM5, and AMM10. The management actions associated with control of invasive plant species would also result in a long-term benefit to the species associated with vernal pool complex habitats by eliminating competitive, invasive species of plants. Ongoing operation, maintenance and management activities would not result in a net permanent reduction in this natural community within the study area. Therefore, there would be no adverse effect on the vernal pool complex natural community.

CEQA Conclusion: The operation and maintenance activities associated with Alternative 4 would have the potential to create minor changes in total acreage of vernal pool complex natural community in the study area, and could create temporary increases sedimentation. The activities could also introduce herbicides periodically to control nonnative, invasive plants. Implementation of environmental commitments and AMM2, AMM4, AMM5, and AMM10 would minimize these impacts, and other operations and maintenance activities, including management, protection and enhancement actions associated with *CM3 Natural Communities Protection and Restoration* and *CM11 Natural Communities Enhancement and Management*, would create positive effects, including reduced competition from invasive, nonnative plants in these habitats. Long-term restoration activities associated with *CM9 Vernal Pool and Alkali Seasonal Wetland Complex Restoration* and protection actions associated with *CM3 Natural Communities Protection and Restoration* would ensure that the acreage of this natural community would not decrease in the study area. Ongoing operation, maintenance and management activities would not result in a net permanent reduction in this natural community within the study area. Therefore, there would be a less-than-significant impact on the vernal pool complex natural community.

Managed Wetland

The conservation components of BDCP Alternative 4 would reduce the acreage of managed wetland currently found in the study area. Initial development and construction of CM1, CM2, CM4, and CM6 would result in both permanent and temporary removal of this community. However, establishing natural community protection and restoration (CM3) and implementing natural community management (CM11) would offset some of this loss. In addition, creation of similar habitat values by restoring tidal brackish emergent wetland and tidal freshwater emergent wetland as part of CM4 would further offset the losses of managed wetland. The net effect would be a substantial decrease in the amount of managed wetlands, but an increase in similar habitat value as the managed wetland is converted to tidal marsh. There would be no adverse effect (see Table 12-4-9). Refer to the Shorebirds and Waterfowl impact discussion at the end of this section (Section 12.3.3.9) for a further consideration of the effects of removing managed wetland natural community.

Table 12-4-9. Changes in Managed Wetland Associated with Alternative 4 (acres)[a]

Habitat Affected[c]	Conservation Measure[b]	Permanent		Temporary		Periodic[d]	
		NT	LLT	NT	LLT	Yolo	Floodplain
	CM1	3	3	8	8		
	CM2	24	24	42	42	643–2,055	
	CM4	4,760	12,786				
	CM5						6
	CM6	Unk.	Unk.	Unk.	Unk.	Unk.	Unk.
	TOTAL IMPACTS	**4,787**	**12,813**	**50**	**50**	**643–2,055**	**6**
Habitat Restored/Created[e]		320	320				
Habitat Protected[e]		3,200	6,500				

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late long-term timeframes.

[b] See discussion below for a description of applicable CMs.

[c] LLT acreages are a summation of effects that would occur in the near-term, early long-term and late long-term timeframes. The LLT acreages represent the total amount of habitat that would be affected over the 50-year life of the BDCP and do not reflect habitat increases that would result from restoration, creation and protection activities.

[d] Periodic effects were estimated for the late long-term only.

[e] Restored/created and protected habitat acreages represent planned conservation activities that would be implemented over the timeframes identified in the BDCP (see BDCP Chapter 3, *Conservation Strategy*, for specifics).

NT = near-term
LLT = late long-term
NA = not applicable
Unk. = unknown

Impact BIO-24: Changes in the acreage of the managed wetland natural community as a result of implementing BDCP conservation measures

Construction, land grading and habitat restoration activities that would accompany the implementation of CM1, CM2, CM4, and CM6 would permanently eliminate an estimated 12,813 acres of managed wetland in the study area. This modification represents approximately 20% of the 64,996 acres of managed wetland that is mapped in the study area. This loss would occur over the 40 years of BDCP restoration activity, as construction activity and tidal marsh restoration proceeds. Managed wetland protection (6,500 acres) and restoration (320 acres) would take place over the same period, but would not replace the acreage lost. The individual effects of the relevant conservation measure are addressed below. A summary statement of the combined impacts and NEPA and CEQA conclusions follows the individual conservation measure discussions.

- *CM1 Water Facilities and Operation*: Construction of the Alternative 4 water conveyance facilities would permanently remove 3 acres and temporarily remove 8 acres of managed wetland community. The permanent and temporary losses would occur primarily on the southeastern side of Tyler Island, adjacent to the North Mokelumne River. A barge unloading facility, batch plant and tunnel work area would create temporary effects, while a permanent access road to the tunnel shaft at that site would create the permanent impact (see Terrestrial Biology Mapbook). Smaller losses would occur from construction of the transmission line that parallels the tunnel alignment. These losses would take place during the near-term construction period.

  If the east-west transmission corridor were selected rather than the north-south corridor, 2 fewer acres of managed wetland would be permanently lost to construction.

- *CM2 Yolo Bypass Fisheries Enhancement*: Implementation of CM2 involves a number of construction activities that could permanently or temporarily remove managed wetland, including west side channels modifications, Putah Creek realignment activities, Lisbon Weir modification and Sacramento Weir improvements. All of these activities could involve excavation and grading in managed wetland areas to improve passage of fish through the bypasses. Based on hypothetical construction footprints, a total of 24 acres could be permanently removed and 42 acres could be temporarily removed. This activity would occur primarily in the near-term timeframe.

- *CM4 Tidal Natural Communities Restoration*: Based on the use of hypothetical restoration footprints, implementation of CM4 would permanently inundate or remove 12,786 acres of managed wetland community. These losses would be expected to occur primarily in the Suisun Marsh ROA, but could also occur in the Cache Slough and West Delta ROAs (see Figure 12-1). These acres of managed wetland would be converted to natural wetland, including large acreages of tidal brackish emergent wetland and tidal freshwater emergent wetland. These natural wetlands provide comparable or improved habitat for the special-status species that occupy managed wetland. An estimated 650 acres of managed wetland would be restored and 6,500 acres would be enhanced and protected through *CM3 Natural Communities Protection and Restoration*. All of the restoration and 3,200 acres of the protection would happen during the first 10 years of BDCP implementation, which would coincide with the timeframe of water conveyance facilities construction and early implementation of CM4. The remaining restoration would be spread over the following 30 years. Managed wetland restoration is expected to include at least 320 acres in CZ 3, CZ 4, CZ 5, and CZ 6 to benefit sandhill crane (Figure 12-1). The enhancement and protection would be focused in Suisun Marsh, but could also occur in CZs with existing managed wetland (CZ 1, CZ 2, CZ 4, CZ 5, CZ 6, and CZ 7).

- *CM6 Channel Margin Enhancement*: Channel margin habitat enhancement could result in filling of small amounts of managed wetland habitat along 20 miles of river and sloughs. The extent of this loss cannot be quantified at this time, but the majority of the enhancement activity would occur on the edges of tidal perennial aquatic habitat, including levees and channel banks. Managed wetland adjacent to these tidal areas could be affected. The improvements would occur within the study area on sections of the Sacramento, San Joaquin and Mokelumne Rivers, and along Steamboat and Sutter Sloughs.

The following paragraphs summarize the combined effects discussed above and describe other BDCP conservation actions that offset or avoid these effects. NEPA and CEQA impact conclusions are also included.

Near-Term Timeframe

During the near-term timeframe (the first 10 years of BDCP implementation), Alternative 4 would permanently remove 4,787 acres and temporarily remove 50 acres of managed wetland through inundation or construction-related losses in habitat from CM1, CM2, and CM4 activities. Eleven acres of this loss would be associated with construction of the water conveyance facilities (CM1). These losses would occur in various locations, but the majority of the near-term loss would occur in Suisun Marsh and the lower Yolo Bypass as tidal marsh is restored.

The construction or inundation loss of this special-status natural community would represent an adverse effect if it were not offset by other conservation actions. Loss of managed wetland natural community would be considered both a loss in acreage of a sensitive natural community and potentially a loss of wetland as defined by Section 404 of the CWA. Many managed wetland areas are interspersed with small natural wetlands that would be regulated under Section 404. The restoration of 320 acres and protection and enhancement of 3,200 acres of managed wetland as part of CM3 during the first 10 years of BDCP implementation would fully offset the losses associated with CM1, but would only partially offset the total near-term loss. Typical project-level mitigation ratios (1:1 for protection) would indicate 11 acres of protection would be needed to offset the 11 acres of loss associated with CM1; a total of 4,837 acres of protection would be needed to offset (i.e., mitigate for) the 4,837 acres of permanent and temporary loss from all near-term actions. The combined protection and restoration proposed for managed wetland in the near-term would fall 997 acres short of full replacement. However, the CM4 marsh restoration activities that would be creating this loss would be simultaneously creating 1,000 acres of tidal brackish emergent wetland and 5,200 acres of tidal freshwater emergent wetland in place of the managed wetland in the near-term. This acreage would significantly exceed the number of acres of managed wetland lost.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training*, *AMM2 Construction Best Management Practices and Monitoring*, *AMM3 Stormwater Pollution Prevention Plan*, *AMM4 Erosion and Sediment Control Plan*, and *AMM10 Restoration of Temporarily Affected Natural Communities*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats at work areas. The AMMs are described in detail in BDCP Appendix 3.C.

In spite of the managed wetland protection, restoration and avoidance measures contained in BDCP Alternative 4, there would be a net reduction in the acreage of this special-status natural community in the near-term. This would be an adverse effect when judged by the significance criteria listed earlier in this chapter. However, the conversion of these managed habitats to natural tidal wetland types that support similar ecological functions (1,000 acres of tidal brackish emergent wetland and 5,200 acres of tidal freshwater emergent wetland) would eliminate this adverse effect. Also, there are other conservation actions contained in the BDCP that would further offset the effects of managed wetland loss on covered and noncovered special-status terrestrial species and on common species that rely on this natural community for some life phase. As a result, there would be no adverse effect.

Late Long-Term Timeframe

At the end of the Plan period, 12,813 acres of managed wetland natural community would be permanently removed by conservation actions, 6,500 acres would be protected and 320 acres would be restored. There would be a net permanent reduction in the acreage of this special-status natural community within the study area. Simultaneously, there would be the creation of 3,000 acres of tidal brackish emergent wetland and 13,900 acres of tidal freshwater emergent wetland in place of this managed wetland. Because these natural wetlands support similar ecological functions to those of managed wetland, there would be no adverse effect.

CEQA Conclusion:

Near-Term Timeframe

During the near-term timeframe (the first 10 years of BDCP implementation), Alternative 4 would permanently remove 4,787 acres and temporarily remove 50 acres of managed wetland through inundation or construction-related losses in habitat from CM1, CM2, and CM4 activities. Eleven acres of this loss would be associated with construction of the water conveyance facilities (CM1) in various locations. The majority of the near-term loss would be in Suisun Marsh and the lower Yolo Bypass as tidal marsh is restored.

The construction or inundation loss of this special-status natural community would represent a significant impact if it were not offset by other conservation actions. Loss of managed wetland natural community would be considered both a loss in acreage of a sensitive natural community and potentially a loss of wetland as defined by Section 404 of the CWA. The restoration of 320 acres and protection and enhancement of 3,200 acres of managed wetland as part of CM3 during the first 10 years of BDCP implementation would fully offset the losses associated with CM1, but would only partially offset the total near-term loss. Typical project-level mitigation ratios (1:1 for protection) would indicate 11 acres of protection would be needed to offset the 11 acres of loss associated with CM1; a total of 4,837 acres of protection would be needed to offset (i.e., mitigate for) the 4,837 acres of permanent and temporary loss from all near-term actions. The combined protection and restoration proposed for managed wetland in the near-term would fall 997 acres short of full replacement. However, the CM4 marsh restoration activities that would be creating this loss would be simultaneously creating 1,000 acres of tidal brackish emergent wetland and 5,200 acres of tidal freshwater emergent wetland in place of the managed wetland in the near-term. This acreage would significantly exceed the number of acres of managed wetland lost.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training*, *AMM2 Construction Best Management Practices and Monitoring*, *AMM3 Stormwater Pollution Prevention Plan*, *AMM4 Erosion and Sediment Control Plan*, and *AMM10 Restoration of Temporarily Affected Natural Communities*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats at work areas. The AMMs are described in detail in BDCP Appendix 3.C.

In spite of the managed wetland protection, restoration and avoidance measures contained in BDCP Alternative 4, there would be a net reduction in the acreage of this special-status natural community in the near-term. This would be a significant impact when judged by the significance criteria listed earlier in this chapter. However, the conversion of these managed habitats to natural tidal wetland types that support similar ecological functions (1,000 acres of tidal brackish emergent wetland and 5,200 acres of tidal freshwater emergent wetland) would eliminate this significant impact. Also, there are other conservation actions contained in the BDCP that would further offset the impacts of managed wetland loss on covered and noncovered special-status terrestrial species and on common species that rely on this natural community for some life phase. As a result, there would be a less-than-significant impact.

Late Long-Term Timeframe

At the end of the Plan period, 12,813 acres of managed wetland natural community would be permanently removed by conservation actions, 6,500 acres would be protected and 320 acres would be restored. There would be a net permanent reduction in the acreage of this special-status natural community within the study area. Simultaneously, there would be the creation of 3,000 acres of tidal brackish emergent wetland and 13,900 acres of tidal freshwater emergent wetland in place of this managed wetland. Because these natural wetlands support similar ecological functions to those of managed wetland, there would be a less-than-significant impact.

Impact BIO-25: Increased frequency and duration of periodic inundation of managed wetland natural community

Two Alternative 4 conservation measures would modify the inundation/flooding regimes of both natural and man-made waterways in the study area. CM2, which is designed to improve fish passage and shallow flooded habitat for Delta fishes in the Yolo Bypass, would increase periodic flooding of managed wetland on wildlife management areas and duck clubs scattered up and down the central and southern bypass. CM5 would expose this community to additional flooding as channel margins are modified and levees are set back to improve fish habitat along some of the major rivers and waterways throughout the study area.

- *CM2 Yolo Bypass Fisheries Enhancement:* Operation of the Yolo Bypass under Alternative 4 would result in an increase in the frequency and duration of inundation of 643–2,055 acres of managed wetland natural community. The area more frequently inundated would vary with the flow regime eventually selected at the newly-constructed notch in the Fremont Weir. This community occurs primarily in the central and southern bypass. The largest acreages are associated with the Sacramento Bypass Wildlife Area, the Yolo Bypass Wildlife Area, and private managed wetlands south of Babel Slough. The anticipated change in management of flows in the Yolo Bypass includes more frequent releases in flows into the bypass from the Fremont and Sacramento Weirs, and in some years, later releases into the bypass in spring months. While the managed wetlands of the Yolo Bypass are conditioned to periodic flooding events, the more frequent and extended flooding periods may make it more difficult to actively manage the areas for maximum food production for certain species (waterfowl primarily) and may alter the plant assemblages in some years. The additional flooding would not reduce the acreage of managed wetland on a permanent basis. The extended flooding would be designed to expand foraging and spawning habitat for Delta fishes.
- *CM5 Seasonally Inundated Floodplain Restoration:* Floodplain restoration would result in an increase in the frequency and duration of inundation of an estimated 6 acres of managed wetland. Specific locations for this restoration activity have not been identified, but they would likely be focused in the south Delta area, along the major rivers and Delta channels. The connection of these wetlands to stream flooding events would be beneficial to the ecological function of managed wetlands, especially as they relate to BDCP target aquatic species. Foraging activity and refuge sites would be expanded into areas currently unavailable or infrequently available to some aquatic species. The more frequent flooding would periodically interfere with management activities and may result in changes in plant composition and management strategies over time.

In summary, 649–2,061 acres of managed wetland community in the study area would be subjected to more frequent inundation from flood flows as a result of implementing two Alternative 4 conservation measures (CM2 and CM5). Managed wetland community would not be adversely affected because much of the acreage affected is conditioned to periodic flooding. This increased inundation would create a beneficial effect on the community as it relates to aquatic species use because the expanded foraging and spawning habitat that would be created would be of great value to aquatic species in the study area. The more frequent flooding could create land management problems and result in long-term changes in plant species composition.

CEQA Conclusion: An estimated 649–2,061 acres of managed wetland community in the study area would be subjected to more frequent inundation from flood flows as a result of implementing CM2 and CM5 under Alternative 4. Managed wetland community would not be significantly impacted because periodic flooding is already experienced by most of the land that would be affected. There could be increased management problems and a long-term shift in plant species composition. The periodic inundation would not result in a net permanent reduction in the acreage of this community in the study area. Therefore, there would be a less-than-significant impact on the community.

Impact BIO-26: Modification of managed wetland natural community from ongoing operation, maintenance and management activities

Once the physical facilities associated with BDCP Alternative 4 are constructed and the stream flow regime associated with changed water management is in effect, there would be new ongoing and periodic actions associated with operation, maintenance and management of the BDCP facilities and conservation lands that could affect managed wetland natural community in the study area. The ongoing actions include changes in operation of upstream reservoirs, the diversion of Sacramento River flows in the north Delta, and reduced diversions from south Delta channels. These actions are associated with CM1 (see Impact BIO-25 for effects associated with CM2). The periodic actions would involve access road and conveyance facility repair, vegetation management at the various water conveyance facilities and habitat restoration sites (CM13), levee repair and replacement of levee armoring, channel dredging, and habitat enhancement in accordance with natural community management plans. The potential effects of these actions are described below.

- *Modified river flows upstream of and within the study area and reduced diversions from south Delta channels.* Changes in releases from reservoirs upstream of the study area, increased diversion of Sacramento River flows in the north Delta, and reduced diversions from south Delta channels would not result in the reduction in acreage of the managed wetland natural community in the study area. Flow levels in the upstream rivers would not change to the degree that water levels in adjacent managed wetlands would be altered. Similarly, increased diversions of Sacramento River flows in the north Delta would not result in a permanent reduction in the managed wetland community downstream of these diversions. Managed wetlands below the diversions are not directly connected to the rivers. Reduced diversions from the south Delta channels would not create a reduction in this natural community.
- *Access road, water conveyance facility and levee repair.* Periodic repair of access roads, water conveyance facilities and levees associated with the BDCP actions have the potential to require removal of adjacent vegetation and could entail earth and rock work in managed wetland habitats. This activity could lead to increased soil erosion, turbidity and runoff entering managed wetlands. These activities would be subject to normal erosion, turbidity and runoff control management practices, including those developed as part of *AMM2 Construction Best Management Practices and Monitoring* and *AMM4 Erosion and Sediment Control Plan.* Any vegetation removal or earthwork adjacent to or within managed wetland habitats would require use of sediment and turbidity barriers, soil stabilization and revegetation of disturbed surfaces. Proper implementation of these measures would avoid permanent adverse effects on this community.

- *Vegetation management.* Vegetation management, in the form of physical removal and chemical treatment, would be a periodic activity associated with the long-term maintenance of water conveyance facilities and restoration sites. Vegetation management is also the principal activity associated with *CM13 Invasive Aquatic Vegetation Control.* Use of herbicides to control nuisance vegetation could pose a long-term hazard to managed wetland natural community at or adjacent to treated areas. The hazard could be created by uncontrolled drift of herbicides, uncontrolled runoff of contaminated stormwater onto the community, or direct discharge of herbicides to managed wetland areas being treated for invasive species removal. This risk is also discussed in Chapter 24, *Hazards and Hazardous Materials,* as Impact HAZ-6. Environmental commitments and *AMM5 Spill Prevention, Containment, and Countermeasure Plan* have been made part of the BDCP to reduce hazards to humans and the environment from use of various chemicals during maintenance activities, including the use of herbicides. These commitments are described in Appendix 3B, including the commitment to prepare and implement spill prevention and control plans and stormwater pollution prevention plans. Best management practices, including control of drift and runoff from treated areas, and use of herbicides approved for use in aquatic and terrestrial environments would also reduce the risk of affecting natural communities adjacent to water conveyance features and levees associated with restoration activities.

  Herbicides to remove aquatic invasive species as part of CM13 would be used to restore the normal ecological function of tidal and nontidal aquatic habitats in planned restoration areas. The treatment activities would be conducted in concert with the California Department of Boating and Waterways' invasive species removal program. Eliminating large stands of water hyacinth and Brazilian waterweed would improve habitat conditions for some aquatic species by removing cover for nonnative predators, improving water flow and removing barriers to movement (see Chapter 11, *Fish and Aquatic Resources*). These habitat changes should also benefit terrestrial species that use managed wetland natural community for movement corridors and for foraging. Vegetation management effects on individual species are discussed in the species sections on following pages.

- *Habitat enhancement.* The BDCP includes a long-term management element for the natural communities within the Plan Area (CM11). For the managed wetland natural community, a management plan would be prepared that specifies actions to improve the value of the habitats for covered species. Actions would include control of invasive nonnative plant and animal species, fire management, restrictions on vector control and application of herbicides, and maintenance of infrastructure that would allow for movement through the community. The enhancement efforts would improve the long-term value of this community for both special-status and common species.

The various operations and maintenance activities described above could alter acreage of managed wetland natural community in the study area through facilities maintenance and vegetation management. Activities could also introduce sediment and herbicides that would reduce the value of this community to common and sensitive plant and wildlife species. Other periodic activities associated with the Plan, including management, protection and enhancement actions associated with *CM3 Natural Communities Protection and Restoration* and *CM11 Natural Communities Enhancement and Management*, would be undertaken to enhance the value of the community. While some of these activities could result in small changes in acreage, these changes would be offset by restoration activities planned as part of *CM4 Tidal Natural Communities Restoration* and protection and restoration actions associated with *CM3 Natural Communities Protection and Restoration*. The management actions associated with levee repair and control of invasive plant species would also result in a long-term benefit to the species associated with managed wetland habitats by improving water movement. Ongoing operation, maintenance and management activities would not result in a net permanent reduction in acreage of this sensitive natural community within the study area. Therefore, there would be no adverse effect on the managed wetland natural community.

CEQA Conclusion: The operation and maintenance activities associated with Alternative 4 would have the potential to create minor changes in total acreage of managed wetland natural community in the study area, and could create temporary increases in turbidity and sedimentation. The activities could also introduce herbicides periodically to control nonnative, invasive plants. Implementation of environmental commitments and AMM2, AMM4, and AMM5 would minimize these impacts, and other operations and maintenance activities, including management, protection and enhancement actions associated with *CM3 Natural Communities Protection and Restoration* and *CM11 Natural Communities Enhancement and Management*, would create positive effects, including improved water movement in and adjacent to these habitats. Long-term restoration activities associated with *CM4 Tidal Natural Communities Restoration* and protection and restoration actions associated with *CM3 Natural Communities Protection and Restoration* would greatly expand the ecological functions of this natural community in the study area. Ongoing operation, maintenance and management activities would not result in a net permanent reduction in this sensitive natural community within the study area. Therefore, there would be a less-than-significant impact on the managed wetland natural community.

Other Natural Seasonal Wetland

The other natural seasonal wetlands natural community encompasses all the remaining natural (not managed) seasonal wetland communities other than vernal pools and alkali seasonal wetlands. These areas mapped by CDFW (Hickson and Keeler-Wolf 2007) consist of seasonally ponded, flooded, or saturated soils dominated by grasses, sedges, or rushes. Most of the mapped areas in the study area are located in the Suisun Marsh ROA on the western edge of the Montezuma Hills and in the interior of the Potrero Hills. There are also other natural seasonal wetlands mapped along Old River in CZ 7 (Figure 12-1). The only BDCP conservation component that would potentially affect this natural community is the seasonally inundated floodplain restoration conservation measure (CM5) (see Table 12-4-10).

Table 12-4-10. Changes in Other Natural Seasonal Wetland Associated with Alternative 4 (acres)[a]

Habitat Affected[c]	Conservation Measure[b]	Permanent		Temporary		Periodic[d]	
		NT	LLT	NT	LLT	Yolo	Floodplain
	CM1						
	CM2						
	CM4						
	CM5						2
	CM6	Unk.	Unk.	Unk.	Unk.	Unk.	Unk.
	TOTAL IMPACTS						
Habitat Restored/Created[e]		320	320				
Habitat Protected[e]		3,200	6,500				

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late long-term timeframes.
[b] See discussion below for a description of applicable CMs.

[c] LLT acreages are a summation of effects that would occur in the near-term, early long-term and late long-term timeframes. The LLT acreages represent the total amount of habitat that would be affected over the 50-year life of the BDCP and do not reflect habitat increases that would result from restoration, creation and protection activities.

[d] Periodic effects were estimated for the late long-term only.

[e] Restored/created and protected habitat acreages represent planned conservation activities that would be implemented over the timeframes identified in the BDCP (see BDCP Chapter 3, *Conservation Strategy*, for specifics).

NT = near-term
LLT = late long-term
NA = not applicable
Unk. = unknown

Impact BIO-27a: Effects on other natural seasonal wetland natural community as a result of implementing BDCP conservation measures

Impact BIO-27b: Increased frequency and duration of periodic flooding of other natural seasonal wetland natural community

Based on theoretical footprints for this activity, *CM5 Seasonally Inundated Floodplain Restoration* could expose 2 acres of other natural seasonal wetland community to additional flooding as channel margins are modified and levees are set back to improve fish habitat along some of the major rivers and waterways throughout the study area. Specific locations for this restoration activity have not been identified, but they would likely be focused in the south Delta area, along the major rivers and Delta channels, including the channel of Old River. The exposure of these wetlands to increased episodes of stream flooding would not alter their ecological function or species composition. Foraging activity and refuge sites would be expanded into areas currently unavailable or infrequently available to some aquatic species.

This community would not be adversely affected because the small increase in periodic flooding would not alter its function or general species makeup. The increased inundation would create a beneficial effect on the other natural seasonal wetland community as it relates to aquatic species use because the expanded foraging and spawning habitat that would be created would be of value to aquatic species in the study area.

CEQA Conclusion: An estimated 2 acres of other natural seasonal wetland community in the study area would be subjected to more frequent inundation from flood flows as a result of implementing CM5 under Alternative 4. This community would not be significantly impacted because a small increase in periodic flooding would not alter its ecological function or species composition. The periodic inundation would not result in a net permanent reduction in the acreage of this community in the study area. Therefore, there would be no substantial adverse effect on the community. The impact would be less than significant.

Impact BIO-28: Modification of other natural seasonal wetland natural community from ongoing operation, maintenance and management activities

Once the physical facilities associated with BDCP Alternative 4 are constructed and the stream flow regime associated with changed water management is in effect, there would be new ongoing and periodic actions associated with operation, maintenance and management of the BDCP facilities and conservation lands that could affect other natural seasonal wetland natural community in the study area. The ongoing actions include modified operation of upstream reservoirs, the diversion of Sacramento River flows in the north Delta, and reduced diversions from south Delta channels. These actions are associated with CM1. The periodic actions would involve access road and conveyance facility repair, vegetation management at the various water conveyance facilities and habitat restoration sites (CM13), levee repair and replacement of levee armoring, channel dredging, and habitat enhancement in accordance with natural community management plans. The potential effects of these actions are described below.

- *Modified river flows upstream of and within the study area and reduced diversions from south Delta channels.* Changes in releases from reservoirs upstream of the study area, increased diversion of Sacramento River flows in the north Delta, and reduced diversions from south Delta channels would not affect other natural seasonal wetland natural community. The small areas mapped in the study area are not in or adjacent to streams that would experience changes in water levels as a result of these operations.

- *Access road, water conveyance facility and levee repair.* Periodic repair of access roads, water conveyance facilities and levees associated with the BDCP actions have the potential to require removal of adjacent vegetation and could entail earth and rock work in other natural seasonal wetland habitats. This activity could lead to increased soil erosion and runoff entering these habitats. These activities would be subject to normal erosion and runoff control management practices, including those developed as part of *AMM2 Construction Best Management Practices and Monitoring* and *AMM4 Erosion and Sediment Control Plan.* Any vegetation removal or earthwork adjacent to or within other natural seasonal wetland habitats would require use of sediment barriers, soil stabilization and revegetation of disturbed surfaces *AMM10 Restoration of Temporarily Affected Natural Communities*. Proper implementation of these measures would avoid permanent adverse effects on this community.

- *Vegetation management.* Vegetation management, in the form of physical removal and chemical treatment, would be a periodic activity associated with the long-term maintenance of water conveyance facilities and restoration sites. Vegetation management is also the principal activity associated with *CM13 Invasive Aquatic Vegetation Control.* Use of herbicides to control nuisance vegetation could pose a long-term hazard to the other natural seasonal wetland natural community at or adjacent to treated areas. The hazard could be created by uncontrolled drift of herbicides, uncontrolled runoff of contaminated stormwater onto the natural community, or direct discharge of herbicides to wetland areas being treated for invasive species removal. This risk is also discussed in Chapter 24, *Hazards and Hazardous Materials,* as Impact HAZ-6. Environmental commitments and *AMM5 Spill Prevention, Containment, and Countermeasure Plan* have been made part of the BDCP to reduce hazards to humans and the environment from use of various chemicals during maintenance activities, including the use of herbicides. These commitments are described in Appendix 3B, including the commitment to prepare and implement spill prevention and control plans and stormwater pollution prevention plans. Best management practices, including control of drift and runoff from treated areas, and use of herbicides approved for use in terrestrial or aquatic environments would also reduce the risk of affecting natural communities adjacent to water conveyance features and levees associated with restoration activities.

- *Habitat enhancement.* The BDCP includes a long-term management element for the natural communities within the Plan Area (CM11). For the other natural seasonal wetland natural community, a management plan would be prepared that specifies actions to improve the value of the habitats for covered species. Actions would include control of invasive nonnative plant and animal species, fire management, restrictions on vector control and application of herbicides, and maintenance of infrastructure that would allow for movement through the community. The enhancement efforts would improve the long-term value of this community for both special-status and common species.

The various operations and maintenance activities described above could alter acreage of other natural seasonal wetland natural community in the study area. Activities could introduce sediment and herbicides that would reduce the value of this community to common and sensitive plant and wildlife species. Other periodic activities associated with the Plan, including management, protection and enhancement actions associated with *CM3 Natural Communities Protection and Restoration* and *CM11 Natural Communities Enhancement and Management*, would be undertaken to enhance the value of the community. While some of these activities could result in small changes in acreage, these changes would be minor when compared to the restoration activities planned as part of *CM9 Vernal Pool and Alkali Seasonal Wetland Complex Restoration*, or minimized by implementation of AMM2, AMM4, AMM5, and AMM10. The vernal pool complex conservation measure includes restoration of 139 acres of seasonal wetlands with similar ecological values as the other natural seasonal wetland community. The management actions associated with control of invasive plant species would also result in a long-term benefit to the species associated with other natural seasonal wetland habitats by eliminating competitive, invasive species of plants. Ongoing operation, maintenance and management activities would not result in a net permanent reduction in this natural community within the study area. Therefore, there would be no adverse effect on the other natural seasonal wetland natural community.

CEQA Conclusion: The operation and maintenance activities associated with Alternative 4 would have the potential to create minor changes in total acreage of other natural seasonal wetland natural community in the study area, and could create temporary increases sedimentation. The activities could also introduce herbicides periodically to control nonnative, invasive plants. Implementation of environmental commitments and AMM2, AMM4, AMM5, and AMM10 would minimize these impacts, and other operations and maintenance activities, including management, protection and enhancement actions associated with *CM3 Natural Communities Protection and Restoration* and *CM11 Natural Communities Enhancement and Management*, would create positive effects, including reduced competition from invasive, nonnative plants in these habitats. Long-term restoration activities associated with *CM9 Vernal Pool and Alkali Seasonal Wetland Complex Restoration* and protection actions associated with *CM3 Natural Communities Protection and Restoration* would ensure that the ecological values provided by this small natural community would not decrease in the study area. Ongoing operation, maintenance and management activities would not result in a net permanent reduction in this natural community within the study area. Therefore, there would be a less-than-significant impact on the other natural seasonal wetland natural community.

Grassland

Construction, operation, maintenance and management associated with the conservation components of Alternative 4 would have no long-term adverse effects on the habitats associated with the grassland natural community. Initial development and construction of CM1, CM2, CM4, CM5, and CM6 would result in both permanent and temporary removal of this community. However, establishing natural community protection (CM3) and implementing natural community restoration (CM8) and management (CM11) would expand and improve grassland habitats in the study area (see Table 12-4-11). The analysis below does not differentiate potential effects on the general grassland community and potential effects on degraded vernal pool grassland described in Section 12.1.2, *Land Cover Types*. This differentiation is made, where relevant, in the species-specific effects analysis later in this section.

Table 12-4-11. Changes in Grassland Natural Community Associated with Alternative 4 (acres)[a]

Habitat Affected[c]	Conservation Measure[b]	Permanent		Temporary		Periodic[d]	
		NT	LLT	NT	LLT	Yolo	Floodplain
	CM1	308	308	255	255		
	CM2	261	261	165	165	386–1,277	
	CM4	651	1,495				
	CM5		449		32		513
	CM6	Unk.	Unk.	Unk.	Unk.	Unk.	Unk.
	TOTAL IMPACTS	**1,220**	**2,513**	**420**	**452**	**386–1,277**	**513**
Habitat Restored/Created[e]		1,140	2,000				
Habitat Protected[e]		2,000	8,000				

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late long-term timeframes.

[b] See discussion below for a description of applicable CMs.

[c] LLT acreages are a summation of effects that would occur in the near-term, early long-term and late long-term timeframes. The LLT acreages represent the total amount of habitat that would be affected over the 50-year life of the BDCP and do not reflect habitat increases that would result from restoration, creation and protection activities.

[d] Periodic effects were estimated for the late long-term only.

[e] Restored/created and protected habitat acreages represent planned conservation activities that would be implemented over the timeframes identified in the BDCP (see BDCP Chapter 3, *Conservation Strategy*, for specifics).

NT = near-term
LLT = late long-term
NA = not applicable
Unk. = unknown

Impact BIO-29: Changes in grassland natural community as a result of implementing BDCP conservation measures

Construction, land grading and habitat restoration activities that would accompany the implementation of CM1, CM2, CM4, CM5, and CM6 would permanently eliminate an estimated 2,513 acres and temporarily remove 452 acres of grassland natural community in the study area. These modifications represent approximately 4% of the 80,355 acres of the community that is mapped in the study area. Approximately half of the permanent and temporary losses would happen during the first 10 years of Alternative 4 implementation, as water conveyance facilities are constructed and habitat restoration is initiated. Grassland protection (2,000 acres) and restoration (1,140 acres) would be initiated during the same period, which would offset the losses, thereby making them not adverse under NEPA and less than significant under CEQA. By the end of the Plan period, 2,000 acres of this natural community would be restored and 8,000 acres would be protected. The individual effects of each relevant conservation measure are addressed below. A summary statement of the combined impacts and NEPA and CEQA conclusions follows the individual conservation measure discussions. The discussion below does not include the potential for permanent loss of grassland natural community from construction of conservation fish hatchery facilities (CM18). There is the potential that these facilities could remove up to 35 acres of grassland in the vicinity of Rio Vista, but the design and location of the facilities have not been firmly established. If these facilities are constructed in grassland near Rio Vista, the CEQA and NEPA conclusions below regarding the grassland natural community would not be altered.

- *CM1 Water Facilities and Operation:* Construction of the Alternative 4 water conveyance facilities would permanently remove 308 acres and temporarily remove 255 acres of grassland natural community. Most of the permanent loss would occur where Intakes 2, 3, and 5 encroach on the Sacramento River's east bank between Clarksburg and Courtland, at various locations along the north-south transmission line corridor, and at the southern forebay adjacent to Clifton Court Forebay. The ruderal and herbaceous grassland areas along the Sacramento River are very narrow bands adjacent to the road and the levee that borders the river (see Terrestrial Biology Mapbook). The grassland lost at the southern forebay and the adjacent spoils disposal area is composed of larger stands of ruderal and herbaceous vegetation and California annual grassland. A smaller acreage of permanent loss would occur at a muck disposal site on Andrus Island, and at the northern forebay just west of Stone Lake. The temporary losses would be associated with construction of the pump stations along the Sacramento River, pipelines connecting the intakes with the northern forebay, and at work areas associated with barge offloading facility construction. The temporary pipeline construction losses would be located in the vicinity of Hood and along Snodgrass Slough. The temporary barge unloading facility impacts would occur along Middle River at Bacon Island, and along North Victoria Canal between Woodward and Victoria Islands. These losses would take place during the near-term construction period.

  If the east-west alignment of the transmission line were used for Alternative 4, there would be 27 fewer acres of permanent grassland loss and 15 more acres of temporary grassland loss. The permanent losses would be reduced where the north-south corridor encroaches on grassland along waterways in the central and south Delta, while the temporary losses would occur where the east-west alignment encroaches on grassland adjacent to Lambert Road between the forebay and Interstate 5.

- *CM2 Yolo Bypass Fisheries Enhancement:* Implementation of CM2 would involve a number of construction activities within the Yolo and Sacramento Bypasses, including Fremont Weir and stilling basin improvements, Putah Creek realignment activities, Lisbon Weir modification and Sacramento Weir improvements. All of these activities could involve excavation and grading in grassland areas to improve passage of fish through the bypasses. Based on hypothetical construction footprints, a total of 261 acres could be permanently lost and another 165 acres could be temporarily removed. Most of the grassland losses would occur at the north end of the bypass below Fremont Weir, along the Toe Drain/Tule Canal, and along the west side channels. These losses would occur primarily in the near-term timeframe.

- *CM4 Tidal Natural Communities Restoration:* Based on the use of hypothetical restoration footprints, implementation of CM4 would permanently inundate or remove 651 acres of grassland in the near-term and inundate or remove 1,495 acres of grassland by the end of the Plan timeframe. The losses would occur in a number of ROAs established for tidal restoration (see Figure 12-1). The largest losses would likely occur in the vicinity of Cache Slough, on Decker Island in the West Delta ROA, on the upslope fringes of Suisun Marsh, and along narrow bands adjacent to waterways in the South Delta ROA. Most of this grassland is ruderal and herbaceous vegetation with low habitat value; some of the larger patches of grassland in the Cache Slough ROA are annual grassland with higher values.

- *CM5 Seasonally Inundated Floodplain Restoration:* Floodplain restoration levee construction would permanently remove 449 acres and temporarily remove 32 acres of grassland natural community. The construction-related losses would be considered a permanent removal of the habitats directly affected. These losses would be expected to occur along the San Joaquin River and other major waterways in CZ 7 (see Figure 12-1). This activity is scheduled to start following construction of water conveyance facilities, which is expected to take 10 years.
- *CM6 Channel Margin Enhancement:* Channel margin habitat enhancement could result in removal of small amounts of grassland natural community along 20 miles of river and sloughs. The extent of this loss cannot be quantified at this time, but the majority of the enhancement activity would occur along waterway margins where grassland habitat stringers exist, including along levees and channel banks. The improvements would occur within the study area on sections of the Sacramento, San Joaquin and Mokelumne Rivers, and along Steamboat and Sutter Sloughs.
- *CM8 Grassland Natural Community Restoration:* The grassland natural community would be restored primarily on the fringes of the Delta, where upland areas merge with Delta wetland and agricultural lands. Restoration would focus on CZ 1, CZ 8, and CZ 11 (Figure 12-1) with a goal of improving habitat connectivity and increasing the diversity of grassland species. Some of the restoration would occur around existing populations of giant garter snake in the east Delta and the Yolo Bypass area.

The following paragraphs summarize the combined effects discussed above and describe other BDCP conservation actions that offset or avoid these effects. NEPA and CEQA impact conclusions are also included.

Near-Term Timeframe

During the near-term timeframe (the first 10 years of BDCP implementation), Alternative 4 would affect the grassland natural community through CM1 construction losses (308 acres permanent and 255 acres temporary) and the CM2 construction losses (261 acres permanent and 165 acres temporary). These losses would occur primarily along the eastern bank of the Sacramento River at intake sites, along pipeline routes connecting these intakes to the northern forebay, at the southern forebay, in the northern Yolo Bypass, and along the east and west channels within the Yolo Bypass. Approximately 651 acres of the inundation and construction-related losses in habitat from CM4 would occur in the near-term. These losses would occur throughout the ROAs mapped in Figure 12-1.

The construction losses of this natural community would not represent an adverse effect based on the significance criteria used for this chapter because grassland is not considered a special-status or sensitive natural community. Most Central Valley grasslands are dominated by nonnative annual grasses and herbs. However, the importance of grassland as a habitat that supports life stages of numerous special-status plants and wildlife is well documented (see BDCP Chapter 3). The significance of losses in grassland habitat is, therefore, discussed in more detail in species analyses later in this chapter. The restoration of 1,140 acres (CM8) and protection of 2,000 acres (CM3) of grassland natural community during the first 10 years of BDCP implementation would offset this near-term loss, avoiding any loss in the availability of this habitat for special-status species. Typical project-level mitigation ratios (2:1 for protection) would indicate that 3,314 acres of protection would be needed to offset (i.e., mitigate for) the 1,657 acres of loss. This conclusion is true regardless of which transmission line corridor is selected for Alternative 4. The east-west alignment would affect 12 fewer acres than the north-south alignment. The combination of the two approaches (2,000 acres of protection and 1,140 acres of restoration) contained in the BDCP is designed to avoid a temporal lag in the value of grassland habitat available to sensitive species.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training*, *AMM2 Construction Best Management Practices and Monitoring*, *AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan*, *AMM7 Barge Operations Plan* and *AMM10 Restoration of Temporarily Affected Natural Communities*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats at work areas and disposal sites. The AMMs are described in detail in BDCP Appendix 3.C.

Late Long-Term Timeframe

Implementation of Alternative 4 as a whole would result in relatively minor (less than 4%) losses of grassland natural community in the study area. These losses (2,513 acres of permanent and 452 acres of temporary loss) would be largely associated with construction of the water conveyance facilities (CM1), construction of Yolo Bypass fish improvements (CM2), and inundation during tidal marsh restoration (CM4). Inundation losses would occur over the 40-year life of the Plan's restoration activities at various tidal restoration sites throughout the study area. By the end of the Plan timeframe, a total of 2,000 acres of this natural community would be restored (CM8) and 8,000 acres would be protected (CM3). The restoration would occur primarily in CZ 1, CZ 8, and CZ 11, in the Cache Slough, Suisun Marsh and Clifton Court Forebay areas. Therefore, Alternative 4 would have a long-term beneficial effect on this natural community.

CEQA Conclusion:

Near-Term Timeframe

Alternative 4 would result in the loss of approximately 1,640 acres of grassland natural community due to construction of the water conveyance facilities (CM1) and fish passage improvements (CM2), and inundation during tidal marsh restoration (CM4). The construction losses would occur primarily along the Sacramento River at intake sites, along pipeline routes connecting these intakes to the northern forebay, at various locations along the north-south transmission line corridor, at the southern forebay, and within the northern section of the Yolo Bypass, while inundation losses would occur at various tidal restoration sites throughout the study area. The construction losses would be spread across a 10-year near-term timeframe.

The construction losses of this natural community would not represent a significant impact based on the significance criteria used for this chapter because grassland is not considered a special-status or sensitive natural community. Nonetheless, these losses would be offset by planned restoration of 1,140 acres and protection of 2,000 acres of grassland natural community scheduled for the first 10 years of BDCP implementation (CM8). AMM1, AMM2, AMM6, AMM7, and AMM10 would also be implemented to minimize impacts. Because of these offsetting near-term restoration and protection activities and AMMs, impacts would be less than significant. This conclusion is true regardless of which transmission line corridor is selected for Alternative 4. The east-west alignment would affect 12 fewer acres than the north-south alignment. Typical project-level mitigation ratios (2:1 for protection) would indicate that 3,280 acres of protection would be needed to offset (i.e., mitigate for) the 1,640 acres of loss. The combination of two approaches (protection and restoration) contained in the BDCP are designed to avoid a temporal lag in the value of grassland habitat available to special-status species. The protection and restoration would be initiated at the beginning of Plan implementation to minimize any time lag in the availability of this habitat to special-status species.

Late Long-Term Timeframe

At the end of the Plan period, 2,965 acres of grassland natural community would be permanently or temporarily removed by conservation actions, 2,000 acres would be restored and 8,000 acres would be protected. There would be no net permanent reduction in the acreage of this natural community within the study area. Therefore, Alternative 4 would have a beneficial impact on this natural community.

Impact BIO-30: Increased frequency and duration of periodic inundation of grassland natural community

Two Alternative 4 conservation measures would modify the inundation/flooding regimes of both natural and man-made waterways in the study area. CM2, which is designed to improve fish passage and shallow flooded habitat for Delta fishes in the Yolo Bypass, would increase periodic flooding of grassland natural community at scattered locations, while CM5 would expose this community to additional flooding as channel margins are modified and levees are set back to improve fish habitat along some of the major rivers and waterways of the study area.

- *CM2 Yolo Bypass Fisheries Enhancement:* Operation of the Yolo Bypass under Alternative 4 would result in an increase in the frequency and duration of inundation of 386–1,277 acres of grassland natural community. The area more frequently inundated would vary with the flow regime eventually selected at the newly-constructed notch in the Fremont Weir. The grassland community occurs throughout the bypass, including a large acreage just below Fremont Weir in the north end of the bypass, in stringers along the internal waterways of the bypass and in larger patches in the lower bypass. The anticipated change in management of flows in the Yolo Bypass includes more frequent releases in flows into the bypass from the Fremont and Sacramento Weirs, and in some years, later releases into the bypass in spring months. The modification of periodic flood events would not adversely affect grassland habitats, as they have persisted under similar high flows and extended flow periods. There is the potential for some change in grass species composition as a result of longer inundation periods.
- *CM5 Seasonally Inundated Floodplain Restoration:* Floodplain restoration would result in an increase in the frequency and duration of inundation of 513 acres of grassland habitats. Specific locations for this restoration activity have not been identified, but they would likely be focused in the south Delta area, along the major rivers and Delta channels in CZ 7 (see Figure 12-1). The increase in periodic stream flooding events would not adversely affect the habitat values and functions of grassland natural community.

In summary, from 899–1,790 acres of grassland natural community in the study area would be subjected to more frequent inundation from flood flows as a result of implementing two Alternative 4 conservation measures (CM2 and CM5). The grassland community is conditioned to periodic inundation from flood flows; therefore, periodic inundation would not result in a net permanent reduction in the acreage of this community in the study area. Increasing periodic flooding of grassland natural community in the Yolo Bypass and along south Delta waterways would not constitute an adverse effect.

CEQA Conclusion: An estimated 899–1,790 acres of grassland natural community in the study area would be subjected to more frequent inundation from flood flows as a result of implementing CM2 and CM5 under Alternative 4. The grassland natural community is conditioned to periodic inundation from flood flows; therefore, periodic inundation would not result in a net permanent reduction in the acreage of this community in the study area. Increasing periodic flooding of grassland natural community in the Yolo Bypass and along south Delta waterways would have a less-than-significant impact on the community.

Impact BIO-31: Modification of grassland natural community from ongoing operation, maintenance and management activities

Once the physical facilities associated with BDCP Alternative 4 are constructed and the stream flow regime associated with changed water management is in effect, there would be new ongoing and periodic actions associated with operation, maintenance and management of the BDCP facilities and conservation lands that could affect grassland natural community in the study area. The ongoing actions include modified operation of upstream reservoirs, the diversion of Sacramento River flows in the north Delta, and reduced diversions from south Delta channels. These actions are associated with CM1 (see Impact BIO-30 for effects associated with CM2). The periodic actions would involve access road and conveyance facility repair, vegetation management at the various water conveyance facilities and habitat restoration sites (CM13), levee repair and replacement of levee armoring, channel dredging, and habitat enhancement in accordance with natural community management plans. The potential effects of these actions are described below.

- *Modified river flows upstream of and within the study area and reduced diversions from south Delta channels.* Changes in releases from reservoirs upstream of the study area, increased diversion of Sacramento River flows in the north Delta, and reduced diversions from south Delta channels would not result in the permanent reduction in acreage of grassland natural community in the study area. Flow levels in the upstream rivers would not change such that the acreage of this community would be reduced on a permanent basis. Similarly, increased diversions of Sacramento River flows in the north Delta would not result in a permanent reduction in grassland natural community downstream of these diversions. Tidal influence on water levels in the Sacramento River and Delta waterways would continue to be dominant. Reduced diversions from south Delta channels would not create a reduction in this natural community.
- *Access road, water conveyance facility and levee repair.* Periodic repair of access roads, water conveyance facilities and levees associated with the BDCP actions have the potential to require removal of adjacent vegetation and could entail earth and rock work in grassland habitats. This activity could lead to increased soil erosion and runoff entering these habitats. These activities would be subject to normal erosion and runoff control management practices, including those developed as part of *AMM2 Construction Best Management Practices and Monitoring* and *AMM4 Erosion and Sediment Control Plan.* Any vegetation removal or earthwork adjacent to or within grassland habitats would require use of sediment barriers, soil stabilization and revegetation of disturbed surfaces (*AMM10 Restoration of Temporarily Affected Natural Communities)*. Proper implementation of these measures would avoid permanent adverse effects on this community.
- *Vegetation management.* Vegetation management, in the form of physical removal and chemical treatment, would be a periodic activity associated with the long-term maintenance of water conveyance facilities and restoration sites. Vegetation management is also the principal activity

associated with *CM13 Invasive Aquatic Vegetation Control.* Use of herbicides to control nuisance vegetation could pose a long-term hazard to grassland natural community at or adjacent to treated areas. The hazard could be created by uncontrolled drift of herbicides, uncontrolled runoff of contaminated stormwater onto the natural community, or direct discharge of herbicides to grassland areas being treated for invasive species removal. This risk is also discussed in Chapter 24, *Hazards and Hazardous Materials,* as Impact HAZ-6. Environmental commitments and *AMM5 Spill Prevention, Containment, and Countermeasure Plan* have been made part of the BDCP to reduce hazards to humans and the environment from use of various chemicals during maintenance activities, including the use of herbicides. These commitments are described in Appendix 3B, including the commitment to prepare and implement spill prevention and control plans and stormwater pollution prevention plans. Best management practices, including control of drift and runoff from treated areas, and use of herbicides approved for use in terrestrial environments would also reduce the risk of affecting natural communities adjacent to water conveyance features and levees associated with restoration activities.

- *Channel dredging.* Long-term operation of the Alternative 4 intakes on the Sacramento River would include periodic dredging of sediments that might accumulate in front of intake screens. The dredging could occur adjacent to grassland natural community. This activity should not adversely affect grassland plants as long as dredging equipment is kept out of grassland areas and dredge spoil is disposed of outside of grassland areas.
- *Habitat enhancement.* The BDCP includes a long-term management element for the natural communities within the Plan Area (CM11). For the grassland natural community, a management plan would be prepared that specifies actions to improve the value of the habitats for covered species. Actions would include control of invasive nonnative plant and animal species, fire management, restrictions on vector control and application of herbicides, and maintenance of infrastructure that would allow for movement through the community. The enhancement efforts would improve the long-term value of this community for both special-status and common species.

The various operations and maintenance activities described above could alter acreage of grassland natural community in the study area through changes in flow patterns and changes in periodic inundation of this community. Activities could also introduce sediment and herbicides that would reduce the value of this community to common and sensitive plant and wildlife species. Other periodic activities associated with the Plan, including management, protection and enhancement actions associated with *CM3 Natural Communities Protection and Restoration* and *CM11 Natural Communities Enhancement and Management*, would be undertaken to enhance the value of the community. While some of these activities could result in small changes in acreage, these changes would be greatly offset by restoration activities planned as part of *CM8 Grassland Natural Community Restoration*, or minimized by implementation of AMM2, AMM4, AMM5, and AMM10. The management actions associated with levee repair, periodic dredging and control of invasive plant species would also result in a long-term benefit to the species associated with grassland habitats by improving water movement in adjacent waterways and by eliminating competitive, invasive species of plants. Ongoing operation, maintenance and management activities would not result in a net permanent reduction in this natural community within the study area. Therefore, there would be no adverse effect on the grassland natural community.

CEQA Conclusion: The operation and maintenance activities associated with Alternative 4 would have the potential to create minor changes in total acreage of grassland natural community in the study area, and could create temporary increases sedimentation. The activities could also introduce herbicides periodically to control nonnative, invasive plants. Implementation of environmental commitments and AMM2, AMM4, AMM5, and AMM10 would minimize these impacts, and other operations and maintenance activities, including management, protection and enhancement actions associated with *CM3 Natural Communities Protection and Restoration* and *CM11 Natural Communities Enhancement and Management*, would create positive effects, including reduced competition from invasive, non-native plants in these habitats. Long-term restoration activities associated with *CM8 Grassland Natural Community Restoration* and protection actions associated with *CM3 Natural Communities Protection and Restoration* would greatly expand this natural community in the study area. Ongoing operation, maintenance and management activities would not result in a net permanent reduction in this natural community within the study area. Therefore, there would be a less-than-significant impact on the grassland natural community.

Inland Dune Scrub

The inland dune scrub natural community is composed of vegetated, stabilized sand dunes associated with river and estuarine systems. In the study area, the inland dune scrub community consists of remnants of low-lying ancient stabilized dunes related to the Antioch Dunes formation located near the town of Antioch (CZ 10; see Figure 12-1). While this community is within the BDCP Plan Area, none of the Alternative 4 conservation measures or covered actions is expected to affect it.

Cultivated Lands

Cultivated lands is the major land cover type in the study area (511,832 acres, see Table 12-1). The Delta, the Yolo Bypass and the Cache Slough drainage are dominated by various types of agricultural activities, with crop production the dominant element (see Figure 12-1). Major crops and cover types in agricultural production include grain and hay crops (wheat, oats and barley), field crops (corn, beans and safflower), truck crops (tomatoes, asparagus and melons), pasture (alfalfa, native and nonnative pasture), rice, orchards, and vineyards. Tables 12-2 and 12-3 list special-status wildlife species supported by cultivated lands.

The effects of Alternative 4 on cultivated lands are discussed from various perspectives in this document. Chapter 14, *Agricultural Resources*, includes a detailed analysis of cropland conversion as it relates to agricultural productivity. Many of the discussions of individual terrestrial plant and wildlife species in this chapter also focus on the relevance of cultivated land loss. Because cultivated lands is not a natural community and because the effects of its loss are captured in the individual species analyses, there is no separate analysis of this land cover type presented here. Table 14-8 in Chapter 14 provides a comparison of important farmland losses from construction of CM1 water conveyance facilities for each alternative, and Table 14A-1 in Appendix 14A provides a similar comparison for losses of individual crops.

Developed Lands

Additional lands in the study area that were not designated with a natural community type have been characterized as developed lands (71,697 acres). Developed lands include lands with residential, industrial, and urban land uses, as well as landscaped areas, riprap, road surfaces and other transportation facilities (see Figure 12-1 and the Terrestrial Biology Mapbook). Developed lands support some common plant and wildlife species, whose abundance and species richness vary with the intensity of development. One special-status species, the giant garter snake, is closely associated with a small element of developed lands; specifically, embankments and levees near water that are covered with riprap provide giant garter snake habitat.

As with cultivated lands, no effort has been made to analyze the effects of Alternative 4 conservation measures on this land cover type because it is not a natural community. The effects of its conversion are discussed in Chapter 13, *Land Use*. Where the loss of developed lands may affect individual special-status species or common species, the impact analysis is contained in that species discussion.

Wildlife Species

Vernal Pool Crustaceans

This section describes the effects of Alternative 4, including water conveyance facilities construction and implementation of other conservation components, on vernal pool crustaceans (California linderiella, Conservancy fairy shrimp, longhorn fairy shrimp, midvalley fairy shrimp, vernal pool fairy shrimp, and vernal pool tadpole shrimp). The habitat model used to assess effects for the vernal pool crustaceans consists of two layers: vernal pool complex, which consists of vernal pools and uplands that display characteristic vernal pool and swale visual signatures that have not been significantly affected by agricultural or development practices; and degraded vernal pool complex, which consists of low-value ephemeral habitat ranging from areas with vernal pool and swale visual signatures that display clear evidence of significant disturbance due to plowing, disking, or leveling to areas with clearly artificial basins such as shallow agricultural ditches, depressions in fallow fields, and areas of compacted soils in pastures. For the purpose of the effects analysis, vernal pool complex is categorized as high-value for vernal pool crustaceans and degraded vernal pool complex is categorized as low-value for these species. Also included as low-value for vernal pool crustaceans are areas along the eastern boundary of Conservation Zone 11 that are mapped as vernal pool complex because they flood seasonally and support typical vernal pool plants, but do not include topographic depressions that are characteristic of vernal pool crustacean habitat.

Construction and restoration associated with Alternative 4 conservation measures would result in permanent losses of vernal pool crustacean modeled habitat as indicated in Table 12-4-12. The majority of the losses would take place over an extended period of time as tidal marsh is restored in the Plan Area. Full implementation of Alternative 4 would restore or create habitat such that there is no net loss of vernal pool acreage and protection of at least 600 acres of vernal pool complex in CZ 1, CZ 8, or CZ 11, primarily in core vernal pool recovery areas (Table 12-4-12).

Alternative 4 with the east-west transmission line alignment would also not result in adverse effects on vernal pool crustaceans for NEPA purposes and would result in less-than-significant impacts under CEQA.

Table 12-4-12. Changes in Vernal Pool Crustacean Modeled Habitat Associated with Alternative 4 (acres)[a]

	Conservation Measure[b]	Habitat Type	Permanent		Temporary		Periodic[e]	
			NT	LLT	NT	LLT	Yolo	Floodplain
Habitat Affected[d]	CM1[c]	High-value (vernal pool complex)	3	3	0	NA	NA	NA

		Low-value (degraded vernal pool complex)	0	0	0	NA	NA	NA
	Total Impacts CM1		**3**	**3**	**0**			
	CM2–CM18[c]	High-value (vernal pool complex)	0	89	0	0	0–4	0
		Low-value (degraded vernal pool complex)	201	417	0	0	0	0
	Total Impacts CM2–CM18		**201**	**506**	**0**	**0**	**0–4**	**0**
	TOTAL IMPACTS		**204**	**509**	**0**	**0**	**0–4**	**0**
Habitat Restored/ Created[f]	CM9 Vernal Pool and Alkali Seasonal Wetland Complex Restoration		40	67	NA	NA	NA	NA
	Total Restoration/Creation		**40**	**67**				
Habitat Protected[g]	CM3 Natural Communities Protection and Restoration		400	600	NA	NA	NA	NA
	Total Protection		**400**	**600**				

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late long-term timeframes.

[b] See discussion below for a description of applicable CMs.

[c] Impact acreage includes those areas that may be indirectly converted by alterations to hydrology

[d] LLT acreages are a summation of effects that would occur in the near-term, early long-term and late long-term timeframes. The LLT acreages represent the total amount of habitat that would be affected over the 50-year life of the BDCP and do not reflect habitat increases that would result from restoration, creation and protection activities.

[e] Periodic effects were estimated for the late long-term only. Yolo periodic impacts are presented as a range based on different flow regimes at the proposed notch in Fremont Weir.

[f] Vernal pool complex restoration objectives requires no net loss of wetted acres. Actual restoration vernal pool complex acreage will depend on the amount lost and the density of wetted acres in the restored areas. Restoration numbers reflect that required with maximum allowable impacts and assumed density of wetted area of 15%.

[g] Protected habitat acreages represent planned conservation activities that would be implemented over the lifetime of the BDCP (see BDCP Chapter 3, Conservation Strategy, for specifics).

NT = near-term

LLT = late long-term

NA = not applicable

Impact BIO-32: Loss or conversion of habitat for and direct mortality of vernal pool crustaceans

Alternative 4 conservation measures would result in the direct, permanent loss of up to 372 acres modeled vernal pool crustacean habitat, all of which would be to low-value habitat and would all be based on the hypothetical footprints for tidal natural communities restoration (CM4). In addition, the conservation measures could result in the indirect conversion due to hydrologic changes of an additional 137 acres of vernal pool crustacean habitat (92 acres of vernal pool complex and 45 acres of degraded vernal pool complex) from conveyance construction (CM1) and based on the hypothetical footprints for tidal restoration (CM4). Construction of the water conveyance facilities and restoration activities may result in the modification of hardpan and changes to the perched water table, which could lead to alterations in the rate, extent, and duration of inundation of nearby vernal pool crustacean habitat. USFWS typically considers construction within 250 feet of vernal pool crustacean habitat to constitute a possible conversion of crustacean habitat unless more detailed information is provided to further refine the limits of any such effects. For the purposes of this analysis, the 250-foot buffer was applied to the water conveyance facilities work areas where surface and subsurface disturbance activities would take place and to restoration hypothetical footprints. Habitat enhancement and management activities (CM11), which include disturbance or removal of nonnative vegetation, could result in local adverse habitat effects.

Because the estimates of habitat loss resulting from tidal inundation are based on projections of where restoration may occur, actual effects are expected to be lower because sites would be selected and restoration projects designed to minimize or avoid effects on the covered vernal pool crustaceans. As specified in the BDCP Objective VPNC1.2 and *CM9 Vernal Pool and Alkali Seasonal Wetland Complex Restoration*, the BDCP Implementation Office would ensure that tidal restoration projects and other covered activities would be designed such that no more than a total of 10 wetted acres of vernal pool crustacean habitat are permanently lost and that no more than 20 wetted acres of vernal pool crustacean habitat are adversely affected due to alterations to hydrology by adjacent BDCP covered activities. The term *wetted acres* refers to an area that would be defined by the three parameter wetland delineation method used by the U.S. Army Corps of Engineers to determine the limits of a wetland using, which involve an evaluation of wetland soil, vegetation, and hydrology characteristics. This acreage differs from vernal pool complex acreages in that a vernal pool complex is composed of individual wetlands (vernal pools) and those upland areas that are in between and surrounding them, which provide the supporting hydrology (surface runoff and groundwater input), organic and nutrient inputs, and refuge for the terrestrial phase of some vernal pool species.

A summary statement of the combined impacts and NEPA and CEQA conclusions follows the individual conservation measure discussions.

- *CM1 Water Facilities and Operation*: Construction of Alternative 4 conveyance facilities could result in the indirect conversion of 3 acres of modeled vernal pool crustacean habitat in the vicinity of the proposed Byron Tract Forebay and associated borrow/spoils area. The affected area consists of vernal pool complex and there are no records of listed vernal pool crustaceans at this location but there are records for vernal pool fairy shrimp and midvalley fairy shrimp in the vicinity of this area (California Department of Fish and Game 2012).

  Alternative 4 with the east-west transmission line option would result in approximately 14 more acres of effects, which include 1 acre of permanent loss, 1 acre of temporary impact, and 12 more acres of potential indirect conversion. Also, these effects would be to high-value vernal pool crustacean habitat located within a portion of the Cosumnes Preserve.

- *CM4 Tidal Natural Communities Restoration:* Tidal natural communities restoration would result in the permanent loss of approximately 372 acres of low-value vernal pool crustacean habitat, which consists of degraded vernal pool complex. The BDCP describes degraded vernal pool complex as areas of low-value ephemeral habitat ranging from areas with vernal pool and swale visual signatures that display clear evidence of significant disturbance due to plowing, disking, or leveling to areas with clearly artificial basins such as shallow agricultural ditches, depressions in fallow fields, and areas of compacted soils in pastures. The actual density of vernal pools or other aquatic features in these areas is unknown, but a 2012 review of Google Earth imagery of these habitats found that they appear to generally have low densities. However, areas mapped as degraded vernal pool complex may still provide habitat for vernal pool crustaceans as evidenced by records of vernal pool fairy shrimp, vernal pool tadpole shrimp, and California linderiella occurring in degraded vernal pool complex in CZ 4 (California Department of Fish and Game 2012). Helm (1998) notes that many vernal pool crustaceans can occur in degraded vernal pool habitats and artificial habitats. In CZ 2 and CZ 4, there are several records of covered vernal pool crustaceans occurring outside of modeled habitat in areas that appear to be road side ditches. So though degraded vernal pool complexes may not represent botanically diverse vernal pools they still can provide habitat for vernal pool crustaceans and thus the loss of 372 acres of degraded vernal pool complex may result in the loss of occupied vernal pool crustacean habitat. In addition, tidal restoration could result in the indirect conversion of 134 acres of vernal pool crustacean habitat, which consist of 89 acres of high-value and 45 acres of low-value habitat. No records of vernal pool crustaceans would be directly impacted by CM4 but there are records of vernal pool fairy shrimp, California linderiella, and vernal pool tadpole shrimp within 250 feet of tidal restoration that may be indirectly affected.

- *CM11 Natural Communities Enhancement and Management:* As described in the BDCP, restoration/creation of vernal pools to achieve no net loss and the protection of 600 acres of vernal pool complex would benefit vernal pool crustaceans (Table 12-4-12). A variety of habitat management actions included in CM11 that are designed to enhance wildlife values in BDCP-protected habitats may result in localized ground disturbances that could temporarily affect vernal pool crustacean habitat. Ground-disturbing activities, such as removal of nonnative vegetation and road and other infrastructure maintenance, are expected to have minor effects on vernal pool crustacean habitat and are expected to result in overall improvements to and maintenance of vernal pool crustacean habitat values over the term of the BDCP. These effects cannot be quantified, but are expected to be minimal and would be avoided and minimized by the AMMs listed below.

The following paragraphs summarize the combined effects discussed above and describe other BDCP conservation actions that offset or avoid these effects. NEPA and CEQA impact conclusions are also included. Table 12-4-13 was prepared to further analyze BDCP using wetted acres of vernal pools in order to compare to the effects of this alternative with the effect limits established in BDCP Chapter 3, Section 3.3, *Biological Goals and Objectives*, which are measured in wetted acres of vernal pools. Wetted acres were estimated by using the BDCP's assumption that restored vernal pool complexes would have a 15% density of vernal pools (i.e., of 100 acres of vernal pool complex 15 acres would constitute vernal pools and the remaining 85 acres supporting uplands). Based on an informal evaluation of aerial photographs of the Plan Area it is likely that the actual densities within the Plan Area are somewhere between 5% and 10%, but the 15% density value was chosen as a conservative estimate for determining effects.

Table 12-4-13. Estimated Effects on Wetted Vernal Pools Associated with Alternative 4 (acres)[a]

		Direct Loss		Indirect Conversion	
		NT	LLT	NT	LLT
BDCP Impact Limit		5	10	10	20
Alternative 4 Impact [a]	CM1	0	0	0.5	0.5
	CM4[b]	30	56	11	20

Total	**30**	**56**	**12**	**21**

[a] These acreages were generated by assuming that the modeled habitat identified in Table 12-4-12 has densities of wetted vernal pools at 15%. The direct effects numbers include permanent and temporary impacts.

[b] These impacts are based on the hypothetical restoration footprints and will likely be lower based on the BDCP's commitment to minimize and avoid effects on vernal pool crustacean habitat as much as practicable.

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the effects of construction would not be adverse under NEPA and would be less than significant under CEQA. Table 12-4-13 above lists the impacts on modeled vernal pool crustacean habitat that is based on the natural community mapping done within the study area. The impacts from tidal natural communities restoration (CM4) are based on hypothetical footprints and do not reflect actual impacts on vernal pool crustacean habitat considering the BDCP's commitment to design restoration projects to minimize or avoid effects on covered vernal pool crustaceans. As seen in Table 12-4-13, the effects of CM1 alone would be well within the near-term limits. The BDCP states that covered activities would not result in more than 5 wetted acres of direct loss and no more than 10 wetted acres of indirect conversion of vernal pools in the near-term. As seen in Table 12-4-13, Alternative 4 would not meet the Plan's near-term biological goals and objectives for direct loss and indirect conversion unless near-term tidal restoration projects are designed to ensure that they do not exceed these impact limits.

Typical NEPA and CEQA project-level mitigation ratios for vernal pools affected by CM1 would be 1:1 for restoration and 2:1 for protection. Typically, indirect conversion impacts are mitigated by protecting vernal pools at a 2:1 ratio. Using these typical ratios would indicate that 1 wetted acre of vernal pool (or 7 acres of vernal pool complex using the 15% density) should be protected to mitigate for the CM1 indirect effects on vernal pool crustacean habitat. If impacts on wetted vernal pools from tidal restoration stay within the BDCP near-term effect limit, the near-term effects of tidal restoration would require up to 5 wetted acres of vernal pool restoration and up to 29 wetted acres of vernal pool protection (or 193 acres of vernal pool complex protection using the 15% density assumption).

Alternative 4 with the east-west transmission line would require 28 more acres of vernal pool complex protection and approximately 0.3 wetted acre of additional vernal pool restoration due to impacts of vernal pool complex within the Cosumnes Preserve.

The BDCP has committed to near-term goal of protecting at least 400 acres of vernal pool complex by protecting at least 2 wetted acres of vernal pools for each wetted acre directly or indirectly affected. The BDCP has also committed to restoring/creating vernal pools such that there is no net loss of vernal pool acreage. The amount of restoration would be determined during implementation based on the following criteria.

- If restoration is completed (i.e., restored natural community meets all success criteria) prior to impacts, then 1.0 wetted acre of vernal pools would be restored for each wetted acre directly affected (1:1 ratio).
- If restoration takes place concurrent with impacts (i.e., restoration construction is completed, but restored habitat has not met all success criteria, prior to impacts occurring),

then 1.5 wetted acres of vernal pools would be restored for each wetted acre directly affected (1.5:1 ratio).

The species-specific biological goals and objectives would also inform the near-term protection and restoration efforts. These Plan goals represent performance standards for considering the effectiveness of restoration actions. The acres of protection and restoration contained in the near-term Plan goals would keep pace with the loss of habitat and effects on vernal pool crustacean habitat.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training*, *AMM2 Construction Best Management Practices and Monitoring, AMM3 Stormwater Pollution Prevention Plan*, *AMM4 Erosion and Sediment Control Plan*, *AMM5 Spill Prevention, Containment, and Countermeasure Plan*, *AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan*, *AMM10 Restoration of Temporarily Affected Natural Communities*, and *AMM12 Vernal Pool Crustaceans*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas. The AMMs are described in detail in BDCP Appendix 3.C.

The near-term effects of Alternative 4 on vernal pool crustaceans would not be adverse under NEPA.

Late Long-Term Timeframe

The BDCP states that covered activities would not result in more than 10 wetted acres of direct loss and no more than 20 wetted acres of indirect conversion effects on vernal pools by the late long-term. As seen in Table 12-4-13, the effects of CM1 alone would be well within the near-term limits but overall Alternative 4 would not meet the Plan's late long-term biological goals and objectives for direct and indirect effects unless near-term tidal restoration projects are designed to ensure that that they do not exceed these impact limits.

The Plan has committed to late long-term goal of protecting at least 600 acres of vernal pool complex in either Conservation Zones 1, 8, or 11, primarily in core vernal pool recovery areas (CM3 and CM9) by protecting at least 2 wetted acres of vernal pools protected for each wetted acre directly or indirectly affected. The Plan also includes a commitment to restore or create vernal pools such that the Plan results in no net loss of vernal pool acreage. The protection and restoration would be achieved using the criteria presented above as well as by following the other specific biological goals and objectives, which include:

- Increasing the size and connectivity of protected vernal pool complexes (VPNC1.3)
- Protecting the range of inundation characteristics that are currently represented by vernal pool throughout the Plan Area (VPNC1.4)
- Protecting at least one currently unprotected occurrence of conservancy fairy shrimp (VPC1.1)

The effects on vernal pool crustacean habitat from Alternative 4 would represent an adverse effect as a result of habitat modification of a special-status species and potential for direct mortality in the absence of other conservation actions. However, habitat protection, restoration, and management and enhancement associated with CM3, CM, and CM11, guided by species-specific goals and objectives, and AMM1–AMM6, AMM10 and AMM12, which would be in place throughout the time period of construction, the effects of Alternative 4 as a whole on vernal pool crustaceans would not be adverse under NEPA.

CEQA Conclusion:

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the impacts of construction would be less than significant. Table 12-4-12 above lists the impacts on modeled vernal pool crustacean habitat that is based on the natural community mapping done within the study area. The impacts from tidal natural communities restoration (CM4) are based on hypothetical footprints and do not reflect actual impacts on vernal pool crustacean habitat considering the BDCP's commitment to design restoration projects to minimize or avoid effects on covered vernal pool crustaceans. As seen in Table 12-4-13, the effects of CM1 alone would be well within the near-term limits. The BDCP states that covered activities would not result in more than 5 wetted acres of direct loss and no more than 10 wetted acres of indirect conversion effects on vernal pools in the near-term. As seen in Table 12-4-13, Alternative 4 would not meet the Plan's near-term biological goals and objectives for direct and indirect effects unless near-term tidal restoration projects are designed to ensure that they do not exceed these impact limits.

Typical NEPA and CEQA project-level mitigation ratios for vernal pools affected by CM1 would be 1:1 for restoration and 2:1 for protection. Typically, indirect conversion impacts are mitigated by protecting vernal pools at a 2:1 ratio. Using these typical ratios would indicate that 1 wetted acre of vernal pool (or 7 acres of vernal pool complex using the 15% density) should be protected to mitigate for the CM1 indirect effects on vernal pool crustacean habitat. If impacts on wetted vernal pools from tidal restoration stay within the BDCP near-term effect limit, the near-term effects of tidal restoration would require up to 5 wetted acres of vernal pool restoration and up to 29 wetted acres of vernal pool protection (or 193 acres of vernal pool complex protection using the 15% density assumption).

Alternative 4 with the east-west transmission line would require 28 more acres of vernal pool complex protection and approximately 0.3 wetted acre of additional vernal pool restoration due to impacts of vernal pool complex within the Cosumnes Preserve.

The BDCP has committed to near-term goal of protecting at least 400 acres of vernal pool complex by protecting at least 2 wetted acres of vernal pools for each wetted acre directly or indirectly affected. The BDCP has also committed to restoring/creating vernal pools such that there is no net loss of vernal pool acreage. The amount of restoration would be determined during implementation based on the following criteria.

- If restoration is completed (i.e., restored natural community meets all success criteria) prior to impacts, then 1.0 wetted acre of vernal pools would be restored for each wetted acre directly affected (1:1 ratio).
- If restoration takes place concurrent with impacts (i.e., restoration construction is completed, but restored habitat has not met all success criteria, prior to impacts occurring), then 1.5 wetted acres of vernal pools would be restored for each wetted acre directly affected (1.5:1 ratio).

The species-specific biological goals and objectives would also inform the near-term protection and restoration efforts. These Plan goals represent performance standards for considering the effectiveness of restoration actions. The acres of protection and restoration contained in the near-term Plan goals would keep pace with the loss of habitat and effects on vernal pool crustacean habitat.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training*, *AMM2 Construction Best Management Practices and Monitoring, AMM3 Stormwater Pollution Prevention Plan*, *AMM4 Erosion and Sediment Control Plan*, *AMM5 Spill Prevention, Containment, and Countermeasure Plan*, *AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan*, *AMM10 Restoration of Temporarily Affected Natural Communities*, and *AMM12 Vernal Pool Crustaceans*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas. The AMMs are described in detail in BDCP Appendix 3.C.

The natural community restoration and protection activities are expected to be concluded in the first 10 years of Plan implementation, which is close enough in time to the occurrence of impacts on constitute adequate mitigation for CEQA purposes. These commitments, implemented together with the AMMs and biological goals and objectives, are more than sufficient to support the conclusion that the near-term effects of Alternative 4 would be less than significant under CEQA. Alternative 4 with the east-west transmission line alignment would also be less than significant under CEQA.

Late Long-Term Timeframe

The BDCP states that covered activities would not result in more than 10 wetted acres of direct loss and no more than 20 wetted acres of indirect conversion effects on vernal pools by the late long-term. As seen in Table 12-4-13, the effects of CM1 alone would be well within the near-term limits but overall Alternative 4 would not meet the Plan's late long-term biological goals and objectives for direct and indirect effects unless near-term tidal restoration projects are designed to ensure that that they do not exceed these impact limits.

The Plan has committed to late long-term goal of protecting at least 600 acres of vernal pool complex in either Conservation Zones 1, 8, or 11, primarily in core vernal pool recovery areas (CM3 and CM9) by protecting at least 2 wetted acres of vernal pools protected for each wetted acre directly or indirectly affected. The Plan also includes a commitment to restore or create vernal pools such that the Plan results in no net loss of vernal pool acreage. The protection and restoration would be achieved using the criteria presented above as well as by following the other specific biological goals and objectives, which include:

- Increasing the size and connectivity of protected vernal pool complexes (VPNC1.3)
- Protecting the range of inundation characteristics that are currently represented by vernal pool throughout the Plan Area (VPNC1.4)
- Protecting at least one currently unprotected occurrence of conservancy fairy shrimp (VPC1.1)

The effects on vernal pool crustacean habitat from Alternative 4 would represent an adverse effect as a result of habitat modification of a special-status species and potential for direct mortality in the absence of other conservation actions. However, habitat protection, restoration, and management and enhancement associated with CM3, CM9, and CM11, guided by species-specific goals and objectives, and AMM1–AMM6, AMM10, and AMM12, which would be in place throughout the time period of construction. Alternative 4 over the term of the BDCP would not result in a substantial adverse effect through habitat modifications and would not substantially reduce the number or restrict the range of vernal pool crustaceans. Therefore, Alternative 4 would have a less-than-significant impact on vernal pool crustaceans. Alternative 4 with the east-west transmission line alignment would also be less-than significant under CEQA.

Impact BIO-33: Indirect effects of plan implementation on vernal pool crustaceans

Construction and maintenance activities associated with water conveyance facilities, and restoration actions could indirectly affect vernal pool crustaceans and their habitat in the vicinity of construction and restoration areas, and maintenance activities. These potential adverse effects would be minimized or avoided through AMM1–AMM6, AMM10, and AMM12, which would be in effect throughout the Plan's construction phase.

Water conveyance construction and restoration activities could indirectly affect vernal pool crustaceans and their habitat in the vicinity of construction areas. Ground-disturbing activities, stockpiling of soils, and maintenance and refueling of heavy equipment could result in the inadvertent release of sediment and hazardous substances into this habitat. These potential effects would be avoided and minimized through AMM1–AMM6, which would be in effect throughout the Plan's construction phase. Vernal pool crustaceans and their habitat could be periodically indirectly affected by maintenance activities at water conveyance facilities. Embankment maintenance activities around Byron Tract and Clifton Court Forebays could result in the inadvertent discharge of sediments and hazardous materials into vernal pool crustacean habitat that occurs along the southern and western boundaries of the forebays. These potential effects would be avoided and minimized through AMM1–AMM6, which would be in effect throughout the term of the Plan.

CEQA Conclusion: Construction and maintenance activities associated with water conveyance facilities, and restoration actions could indirectly impact vernal pool crustaceans and their habitat in the vicinity of construction and restoration areas, and maintenance activities. These potential impacts would be minimized or avoided through AMM1–AMM6, AMM10, and AMM12, which would be in effect throughout the Plan's construction phase. These impacts would be less than significant under CEQA.

Impact BIO-34: Periodic effects of inundation of vernal pool crustacean habitat as a result of implementation of conservation components

Flooding of the Yolo Bypass under *CM2 Yolo Bypass Fisheries Enhancement* would periodically affect 0 to 4 acres of modeled vernal pool crustacean habitat (Table 12-4-12). There would be no periodic effects from *CM5 Seasonally Inundated Floodplain Restoration*.

BDCP Appendix 5J, *Effects on Natural Communities, Wildlife, and Plants*, describes the methods used to estimate periodic inundation effects in the Yolo Bypass. Based on this method, periodic inundation could affect vernal pool crustaceans occupying areas ranging from 0 acres of habitat during most notch flows to an estimated 4 acres during a notch flow of 6,000 cfs. BDCP-associated inundation of areas that would not otherwise have been inundated is expected to occur in no more than 30% of all years, because Fremont Weir is expected to overtop the remaining 70% of all years, and during those years notch operations will not typically affect the maximum extent of inundation. In more than half of all years under existing conditions, an area greater than the BDCP-related inundation area already inundates in the bypass. Yolo Bypass flooding is expected to have a minimal effect on vernal pool crustaceans and would thus not be adverse under NEPA.

CEQA Conclusion: Alternative 4 would periodically inundate at most 4 acres of vernal pool crustacean habitat during the maximum flows over the Fremont Weir. The periodic inundation is not anticipated to result in a conversion of vernal pool crustacean habitat into different wetland habitat. BDCP-associated inundation of areas that would not otherwise have been inundated is expected to occur in no more than 30% of all years, because Fremont Weir is expected to overtop the remaining 70% of all years, and during those years notch operations will not typically affect the maximum extent of inundation. In more than half of all years under existing conditions, an area greater than the BDCP-related inundation area already inundates in the bypass. Yolo Bypass flooding is expected to have a minimal effect on vernal pool crustaceans and would thus result in less-than-significant impacts on the species.

Valley Elderberry Longhorn Beetle

The habitat model used to assess the effects for valley elderberry longhorn beetle is based on riparian habitat and non-riparian habitat (vernal pool complexes and grasslands within 200 feet of channels). Construction and restoration associated with Alternative 4 conservation measures would result in both temporary and permanent losses of valley elderberry longhorn beetle modeled habitat as indicated in Table 12-4-14. The majority of the losses would take place over an extended period of time as the restoration conservation measures are being implemented. In addition, an estimated 21 elderberry shrubs could be impacted by Alternative 4. Full implementation of the conservation measures would protect 750 and restore or create 5,000 acres of riparian habitat (*CM7 Riparian Natural Community Restoration*), which would include criteria for restoring valley elderberry beetle habitat. In addition, the implementation of AMM15, which would require the transplanting of shrubs affected by construction and restoration and the planting of elderberry seedlings and associated natives according to USFWS guidelines (U.S. Fish and Wildlife Service 1999a), would also be available to avoid and minimize effects on the species. As explained below, with the restoration or protection of these amounts of habitat, impacts on valley elderberry longhorn beetle would not be adverse for NEPA purposes and would be less than significant for CEQA purposes. Alternative 4 with the east-west transmission line alignment would also not be adverse for NEPA purposes and would be less than significant for CEQA purposes.

Table 12-4-14. Changes in Valley Elderberry Longhorn Beetle Modeled Habitat Associated with Alternative 4 (acres)[a]

	Conservation Measure[b]	Habitat Type	Permanent		Temporary		Periodic[d]	
			NT	LLT	NT	LLT	Yolo	Floodplain
Habitat Affected[c]	CM1	Riparian	49	49	25	25	NA	NA
		Non-riparian	185	185	69	69	NA	NA
	Total Impacts CM1		**234**	**234**	**94**	**94**		
	CM2–CM18	Riparian	514	811	136	171	104–247	265
		Non-riparian	164	336	87	100	46–85	286
	Total Impacts CM2–CM18		**678**	**1,147**	**223**	**271**	**155–332**	**551**
	TOTAL IMPACTS		**912**	**1,381**	**317**	**365**	**155–332**	**551**
Habitat Restored/ Created[e]	CM7 Riparian		800	5,000	NA	NA	NA	NA
	Total Restoration/ Creation		**800**	**5,000**				
Habitat Protected[e]	CM7 Riparian		750	750	NA	NA	NA	NA
	Total Protection		**750**	**750**				

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late long-term timeframes.
[b] See discussion below for a description of applicable CMs.
[c] LLT acreages are a summation of effects that would occur in the near-term, early long-term and late long-term timeframes. The LLT acreages represent the total amount of habitat that would be affected over the 50-year

life of the BDCP and do not reflect habitat increases that would result from restoration, creation and protection activities.

[d] Periodic effects were estimated for the late long-term only. Yolo periodic impacts are presented as a range based on different flow regimes at the proposed notch in Fremont Weir.

[e] Restored/created and protected habitat acreages represent planned conservation activities that would be implemented over the lifetime of the BDCP (see BDCP Chapter 3, *Conservation Strategy*, for specifics).

NT = near-term

LLT = late long-term

NA = not applicable

Impact BIO-35: Loss of valley elderberry longhorn beetle habitat

Alternative 4 conservation measures would result in the permanent and temporary loss combined of up to 1,746 acres of modeled valley elderberry longhorn beetle habitat (1,056 acres of riparian habitat and 690 acres of non-riparian habitat), and an estimated 21 elderberry shrubs, which represent potential habitat for the species (Table 12-4-14). Due to the limitation of the habitat suitability model, all of these effects are assumed to be a large overestimate of the true effect on potential valley elderberry longhorn beetle habitat. Conservation measures that would result in these losses are conveyance facilities and transmission line construction, and establishment and use of borrow and spoil areas (CM1), Fremont Weir/Yolo Bypass improvements (CM2), tidal habitat restoration (CM4), and floodplain restoration (CM5). Habitat enhancement and management activities (CM11), which include ground disturbance or removal of nonnative vegetation, could result in local adverse habitat effects. In addition, maintenance activities associated with the long-term operation of the water conveyance facilities and other BDCP physical facilities could degrade or eliminate valley elderberry longhorn beetle habitat. Timely implementation of the near-term habitat protection and restoration contained in the Plan and implementation of AMMs committed to in the Plan would result in no adverse effects under NEPA and less-than-significant impacts under CEQA. Each of these activities is described below.

- *CM1 Water Facilities and Operation*: Construction of Alternative 4 conveyance facilities would result in the permanent and temporary combined loss of approximately 328 acres of modeled valley elderberry longhorn beetle habitat, composed of 74 acres of riparian habitat and 254 acres of non-riparian habitat (Table 12-4-14). In addition, an estimated 21 shrubs could be potentially removed as a result of conveyance facility construction. The exact number of shrubs to be impacted would be determined during pre-construction surveys of the footprints of the conveyance facility and associated work areas. Most of these impacts are associated with the intake and forebay construction in the north delta. There are no records of valley elderberry longhorn beetle within these impact areas. The portion of the above impacts that result from temporary habitat loss includes 94 acres of modeled valley elderberry longhorn beetle habitat (25 acres riparian and 69 acres non-riparian habitat). Elderberry shrubs could be affected from ground-disturbing activities associated with conveyance construction footprints, temporary access roads, and staging areas.

  Alternative 4 with the east-west transmission line would result a total of 330 acres of permanent and temporary impacts on modeled valley elderberry longhorn beetle habitat (80 acres of riparian and 250 acres non-riparian), which is 2 more acres of modeled habitat.

- *CM2 Yolo Bypass Fisheries Enhancement*: Construction activity associated with fisheries improvements in the Yolo Bypass would result in the permanent and temporary removal of approximately 489 acres of modeled valley elderberry longhorn beetle habitat, composed of 353 acres of riparian habitat and 136 acres of non-riparian habitat. Approximately 265 acres of permanent impacts (217 acres of riparian and 49 acres of non-riparian) would mostly occur at the north end of the Yolo Bypass from Fremont Weir improvements. The 224 acres of temporary impacts (137 acres of riparian and 87 acres of non-riparian) would mostly be from work on the Fremont Weir, the Sacramento Weir, and levees along the Bypass. Elderberry shrubs could be affected from ground-disturbing activities associated with the re-contouring of surface topography, excavation or modification of channels, levee modification, and removal of riprap and other protections from channel banks.

- *CM4 Tidal Natural Communities Restoration*: Tidal natural communities restoration would result in the permanent loss of approximately 831 acres of modeled valley elderberry longhorn beetle habitat, composed of 552 acres of riparian and 279 acres of non-riparian habitat. The majority of these impacts would be associated with tidal restoration in the Delta and only 42 acres of these impacts (all non-riparian) would be from tidal restoration in Suisun Marsh. Elderberry shrubs could be affected from ground-disturbing activities associated with the re-contouring of surface topography, excavation or modification of channels, type conversion from riparian and grasslands to tidal habitat, levee removal and modification, and removal of riprap and other protections from channel banks.
- *CM5 Seasonally Inundated Floodplain Restoration*: Levee construction associated with floodplain restoration in the south Delta (CZ 7) would result in the permanent and temporary removal of approximately 99 acres of valley elderberry longhorn beetle habitat, composed of 78 acres of riparian and 21 acres of non-riparian. Approximately half of these impacts (51 acres) would be permanent impacts from levee construction and the other half (48 acres) would be temporary impacts associated with the levee construction. There is one record of valley elderberry longhorn beetle occurring in CZ7 just wet of Middle River on Union Island. This record and other elderberry shrubs could be affected from ground-disturbing activities associated with the re-contouring of surface topography, excavation or modification of channels, levee removal and modification, and removal of riprap and other protections from channel banks.
- *CM11 Natural Communities Enhancement and Management*: Activities associated with natural communities enhancement and management, such as grazing practices and ground disturbance or herbicide use in the control of nonnative vegetation, intended to maintain and improve habitat functions of BDCP protected habitats for covered species could result in loss of elderberry shrubs and the potential for injury or mortality to beetles. These effects cannot be quantified, but are expected to be minimal and would be avoided and minimized by the AMMs listed below.
- Operations and maintenance: Post-construction operation and maintenance of the above-ground water conveyance facilities and restoration infrastructure could result in ongoing but periodic disturbances that could affect valley elderberry beetle. Maintenance activities would include vegetation management, levee and structure repair, and re-grading of roads and permanent work areas could potentially affect elderberry shrubs occupied by the species. These effects, however, would be reduced by AMMs described below.

The following paragraphs summarize the combined effects discussed above and describe other BDCP conservation actions that offset or avoid these effects. NEPA and CEQA impact conclusions are also included.

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the effects of construction would not be adverse under NEPA and would be less than significant under CEQA. Alternative 4 would result in permanent and temporary impacts on 1,229 acres of modeled habitat (724 acres of riparian and 505 acres of non-riparian) for valley elderberry longhorn beetle in the study area in the near-term. These effects would result from the construction of the water conveyance facilities (CM1, 74 acres of riparian and 254 acres of non-riparian), and implementing other conservation measures (Yolo Bypass fisheries improvements [CM2] and tidal restoration [CM4], 901 acres of modeled habitat). The other conservation measures account for 650 of the 724 acres (90%) of impacts on riparian habitat. Based on limited DWR survey data of the Conveyance Planning Area (see Appendix 12C), an estimated 21 elderberry shrubs would be impacted in the near-term.

Typical NEPA and CEQA project-level mitigation ratios for those natural communities affected by CM1 and that are identified as habitat for valley elderberry longhorn beetle in Chapter 3 of the BDCP would be 1:1 for restoration and 1:1 for protection for riparian habitat. Using these typical ratios would indicate that 74 acres of the riparian habitat should be restored/created and 74 acres of existing riparian should be protected to mitigate for the CM1 losses of valley elderberry longhorn beetle habitat. The near-term effects of other conservation actions would require 650 acres of riparian restoration and 650 acres of riparian protection using the same typical NEPA and CEQA ratios (1:1 for restoration and 1:1 for protection).

Alternative 4 with the east-west transmission line would require 6 more acres of restored/created riparian habitat and 6 acres of protected habitat.

The BDCP has committed to near-term goals of protecting 750 acres of riparian and restoring 800 acres of riparian habitat in the Plan Area. These conservation actions would occur in the same timeframe as the construction and early restoration losses, thereby avoiding adverse effects on valley elderberry longhorn beetle. In addition, BDCP Objectives VELB 1.1 and 1.2, which call for implementing the USFWS (1999) conservation guidelines for valley elderberry longhorn beetle (transplanting elderberry shrubs and planting elderberry seedlings and associated natives) and siting elderberry restoration within drainages immediately adjacent to or in the vicinity of sites confirmed to be occupied by valley elderberry longhorn beetle. These objectives would be met through the implementation of CM7 *Riparian Natural Community Restoration*. CM7 *Riparian Natural Community Restoration* specifically calls for the planting of elderberry shrubs in large, contiguous clusters with a mosaic of associated natives as part of riparian restoration consistent with USFWS (1999) conservation guidelines. These Plan goals represent performance standards for considering the effectiveness of restoration actions. The acres of protection and restoration contained in the near-term Plan goals and the additional species specific measures within CM7 satisfy the typical mitigation that would be applied to the project-level effects of CM1, as well as mitigating the near-term effects of the other conservation measures.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training*, *AMM2 Construction Best Management Practices and Monitoring*, *AMM3 Stormwater Pollution Prevention Plan*, *AMM4 Erosion and Sediment Control Plan*, *AMM5 Spill Prevention, Containment, and Countermeasure Plan*, *AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan*, and *AMM15*

Valley Elderberry Longhorn Beetle. AMM15 requires surveys for elderberry shrubs within 100 feet of any ground disturbing activities and the implementation avoidance and minimize measures for any shrubs that are identified within this 100-foot buffer. All of these AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas and disposal sites. The AMMs are described in detail in BDCP Appendix 3.C.

Late Long-Term Timeframe

Based on modeled habitat, the study area supports approximately 34,680 acres of modeled habitat (17,998 acres of riparian and 28,334 acres of non-riparian) for valley elderberry longhorn beetle. Alternative 4 as a whole would result in the permanent loss of and temporary effects on 1,746 acres of modeled valley elderberry longhorn beetle habitat (1,056 acres of riparian habitat and 690 acres of non-riparian habitat)during the term of the Plan (5% of the modeled habitat in the study area). The locations of these losses are described above in the analyses of individual conservation measures. The Plan includes a commitment to protect at least 750 acres of riparian habitat and restoring/creating at least 5,000 acres of riparian habitat in the Plan Area. Other factors relevant to effects on valley elderberry longhorn beetle include:

- Habitat loss is widely dispersed throughout the study area and would not be concentrated in any one location.
- There would be a temporal loss of riparian habitat during the near-term evaluation period because most of the affected riparian vegetation would be removed during the near-term timeframe, while large quantities of riparian habitat would not be restored until the early and late long-term timeframes. Effects on valley elderberry longhorn beetle of this temporal loss of riparian vegetation are expected to be minimal because much of the riparian habitat in the Plan Area is not known to be currently occupied by the species, because all elderberry shrubs that are suitable for transplantation would be moved to conservation areas in the Plan Area, and because most of the affected community is composed of small patches of riparian scrub and herbaceous vegetation that are fragmented and distributed across the agricultural landscape of the Plan Area and thus are likely to provide no or low-value habitat for the beetle.
- Temporarily disturbed areas would be restored within 1 year following completion of construction and management activities. Under AMM10, a restoration and monitoring plan would be developed prior to initiating any construction-related activities associated with the conservation measures or other covered activities that would result in temporary effects on natural communities.

The losses of valley elderberry longhorn beetle habitat associated with Alternative 4 as a whole would represent an adverse effect as a result of habitat modification of a special-status species and potential for direct mortality in the absence of other conservation actions. However, with habitat protection and restoration associated with CM7, guided by species-specific goals and objectives and AMM1–AMM6, AMM10, and AMM15, which would be in place throughout the time period any construction activity would be occurring, the effects of Alternative 4 as a whole on valley elderberry longhorn beetle would not be adverse under NEPA. The effects of Alternative 4 with the east-west transmission line alignment would also not be adverse under NEPA.

CEQA Conclusion: Alternative 4 (CM1, CM2, CM4, and CM5) would have both temporary and permanent impacts on valley elderberry longhorn beetle and its modeled habitat.

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the impacts of construction would be less than significant. Alternative 4 would result in permanent and temporary impacts on 1,229 acres of modeled habitat (724 acres of riparian and 505 acres of non-riparian) for valley elderberry longhorn beetle in the study area in the near-term. These effects would result from the construction of the water conveyance facilities (CM1, 74 acres of riparian and 254 acres of non-riparian), and implementing other conservation measures (Yolo Bypass fisheries improvements [CM2] and tidal restoration [CM4], 901 acres of modeled habitat). Based on limited DWR survey data of the Conveyance Planning Area, an estimated 21 elderberry shrubs would be impacted in the near-term.

Typical NEPA and CEQA project-level mitigation ratios for those natural communities affected by CM1 and that are identified in the biological goals and objectives for valley elderberry longhorn beetle in Chapter 3 of the BDCP would be 1:1 for restoration and 1:1 for protection for riparian habitat. Using these typical ratios would indicate that 74 acres of the riparian habitat should be restored/created and 74 acres of existing riparian should be protected to mitigate for the CM1 losses of valley elderberry longhorn beetle habitat. The near-term effects of other conservation actions would require 650 acres of riparian restoration and 650 acres of riparian protection using the same typical NEPA and CEQA ratios (1:1 for restoration and 1:1 for protection).

Alternative 4 with the east-west transmission line would require 6 more acres of restored/created riparian habitat and 6 acres of protected habitat.

The BDCP has committed to near-term goals of protecting 750 acres of riparian and restoring 800 acres of riparian habitat in the Plan Area. These conservation actions would occur in the same timeframe as the construction and early restoration losses, thereby avoiding adverse effects on valley elderberry longhorn beetle. In addition, BDCP Objectives VELB 1.1 and 1.2, which call for implementing the USFWS (1999) conservation guidelines for valley elderberry longhorn beetle (transplanting elderberry shrubs and planting elderberry seedlings and associated natives) and siting elderberry restoration within drainages immediately adjacent to or in the vicinity of sites confirmed to be occupied by valley elderberry longhorn beetle. These objectives would be met through the implementation of *CM7 Riparian Natural Community Restoration*. CM7 specifically calls for the planting of elderberry shrubs in large, contiguous clusters with a mosaic of associated natives as part of riparian restoration consistent with USFWS (1999) conservation guidelines.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training*, *AMM2 Construction Best Management Practices and Monitoring*, *AMM3 Stormwater Pollution Prevention Plan*, *AMM4 Erosion and Sediment Control Plan*, *AMM5 Spill Prevention, Containment, and Countermeasure Plan*, *AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan*, and *AMM15 Valley Elderberry Longhorn Beetle*. AMM15 requires surveys for elderberry shrubs within 100 feet of any ground disturbing activities and the implementation avoidance and minimize measures for any shrubs that are identified within this 100-foot buffer. All of these AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas and disposal sites. The AMMs are described in detail in BDCP Appendix 3.C.

The natural community restoration and protection activities are expected to be concluded in the first 10 years of Plan implementation, which is close enough in time to the occurrence of impacts on constitute adequate mitigation for CEQA purposes. These commitments, implemented together with the AMMs, are more than sufficient to support the conclusion that the near-term effects of Alternative 4 would be less than significant under CEQA. Alternative 4 with the east-west transmission line alignment would also be less than significant under CEQA.

Late Long-Term Timeframe

Alternative 4 as a whole would result in the permanent loss of and temporary effects on 1,746 acres of modeled valley elderberry longhorn beetle habitat (1,056 acres of riparian habitat and 690 acres of non-riparian habitat)during the term of the Plan (5% of the modeled habitat in the study area). The locations of these losses are described above in the analyses of individual conservation measures. The Plan includes a commitment to protect at least 750 acres of riparian habitat and restoring/creating at least 5,000 acres of riparian habitat in the Plan Area. The BDCP also includes a number of AMMs (AMM1–AMM6, AMM10, and AMM15) directed at minimizing or avoiding potential impacts on valley elderberry longhorn beetle. The large acreages of conservation would adequately compensate for the modeled habitats lost to construction and restoration activities.

Considering these protection and restoration provisions, which would provide acreages of new or enhanced habitat in amounts greater than necessary to compensate for habitats lost to construction and restoration activities, implementation of Alternative 4 as a whole would not result in a substantial adverse effect through habitat modifications and would not substantially reduce the number or restrict the range of the species. Therefore, the alternative would have a less-than-significant impact on valley elderberry longhorn beetle. Alternative 4 with the east-west transmission line alignment would also be less-than significant under CEQA.

Impact BIO-36: Indirect effects on valley elderberry longhorn beetle and its habitat

Construction activities associated with water conveyance facilities, conservation components and ongoing habitat enhancement, as well as operation and maintenance of above-ground water conveyance facilities, including the transmission facilities, could result in ongoing periodic post-construction disturbances with localized impacts on valley elderberry longhorn beetle over the term of the BDCP. Construction related effects could result from ground-disturbing activities, stockpiling of soils, and maintenance and refueling of heavy equipment could result in dust and the inadvertent release of hazardous substances into the species habitat. Restoration activities could result in excavation or modification of channels, type conversion from riparian and grasslands to tidal habitat, levee removal and modification, and removal of riprap and other protections from channel banks that occur within 100 feet of an elderberry shrubs. These potential adverse effects would be minimized or avoided through AMM1–AMM6, AMM10, and AMM15, which would be in effect throughout the Plan's construction phase. Therefore, the indirect effects of Alternative 4 would not have an adverse effect on valley elderberry longhorn beetle. Alternative 4 with the east-west transmission line alternative would not have an adverse effect on valley elderberry longhorn beetle.

CEQA Conclusion: Ground-disturbing activities, stockpiling of soils, and the potential release of dust and hazardous substances would accompany construction of the water conveyance facilities. In addition, ground-disturbing activities associated with the re-contouring of surface topography, excavation or modification of channels, type conversion from riparian and grasslands to tidal habitat, levee removal and modification, and removal of riprap and other protections from channel banks could indirectly affected elderberry shrubs that occur within 100 feet of these restoration activities. With the implementation of AMM1–AMM6, AMM10, and AMM15 as part of Alternative 4 construction, operation, and maintenance, the BDCP would avoid the potential for substantial adverse indirect effects on valley elderberry longhorn beetle in that the Plan would not result in a substantial reduction in numbers or a restriction in the range of valley elderberry longhorn beetle. Therefore, the indirect effects under this alternative would have a less-than-significant impact on valley elderberry longhorn beetle. Alternative 4 with the east-west transmission line alignment would also have a less-than significant impact on the species.

Impact BIO-37: Periodic effects of inundation of valley elderberry longhorn beetle habitat as a result of implementation of conservation components

Flooding of the Yolo Bypass from *CM2 Yolo Bypass Fisheries Enhancement* would periodically affect 155 to 332 acres of modeled valley elderberry longhorn beetle habitat (Table 12-4-14).

CM5 Seasonally Inundated Floodplain Restoration would periodically inundate 551 acres of modeled valley elderberry longhorn beetle habitat (Table 12-4-14).

It is unknown at this time how much of the modeled habitat that would be inundated as a result of CM2 and CM5 actually contains elderberry shrubs. Elderberry shrubs have been found to be intolerant of long periods of inundation and there is evidence that they die very quickly after even short periods of flooding (River Partners 2008). During monitoring of a restoration project at the San Joaquin River National Wildlife Refuge, River Partners found that nearly all (99 to 100%) of the four year old elderberry shrubs in restoration plots died after 15–17 weeks of inundation, and River Partners noted in general that the shrubs died very quickly after even short periods of flooding (River Partners 2008). Talley et al (2006) in their report assisting the USFWS 5-year review of the species, note that elderberry shrubs respond negatively to saturated soil conditions and that they can only tolerate temporary root crown inundation. Therefore, in the areas that would be periodically inundated by the implementation of CM2 it is likely that there are few, if any, mature shrubs in these areas because under current conditions they would be inundated in about 50% of all years for approximately 7 weeks. The areas affected by CM5 are not currently inundated and thus elderberry shrubs could be present in these areas.

The periodic effects on modeled habitat for valley elderberry longhorn beetle associated with implementing Alternative 4 could adversely affect valley elderberry longhorn beetle habitat (elderberry shrubs) and make modeled habitat there unsuitable for future elderberry establishment. Based on the information presented above, the current conditions in those areas that would be periodically inundated in Yolo Bypass (CM2) are not believed to be very suitable for elderberry shrubs and thus there would not likely be an adverse effect to the species there. The modeled habitat that would be periodically inundated from the implementation of CM5 could result in adverse effects on valley elderberry longhorn beetle. However, with habitat protection and restoration as part of CM7, guided by species-specific goals and objectives, and AMM1–AMM6, AMM10, and AMM15, which would be in place throughout the time period that any of the floodplain restoration would be occurring, the periodic effects of inundation resulting from Alternative 4 on valley elderberry longhorn beetle would not be adverse under NEPA.

CEQA Conclusion: Alternative 4 (CM5) would have periodic impacts on modeled valley elderberry longhorn beetle habitat. The periodic inundation of 551 acres of modeled habitat with floodplain restoration areas could result in the death of elderberry shrubs that may occur there and thus potentially impact valley elderberry longhorn beetle. The Plan includes the restoration of 5,000 acres of riparian habitat and the protection of 750 acres riparian habitat (CM7) would include areas for elderberry restoration and protection. The BDCP also includes AMM1–AMM6, AMM10, and AMM15, that would minimize and avoid impacts on valley elderberry longhorn beetle prior to floodplain restoration activities. AMM15, which includes measure for following the USFWS (1999) conservation guidelines for valley elderberry longhorn beetle, would be used to identify shrubs for transplanting to conservation areas that otherwise could be adversely affected by periodic inundation in floodplain restoration areas. These conservation actions would compensate for the periodic impacts on valley elderberry longhorn beetle.

Considering these protection and restoration provisions and avoidance and minimization measures, implementation of Alternative 4 as a whole would not result in a substantial adverse effect through habitat modifications and would not substantially reduce the number or restrict the range of the species. Therefore, periodic effects of inundation resulting from Alternative 4 would have a less-than-significant impact on valley elderberry longhorn beetle. Alternative 4 with the east-west transmission line would also have a less-than-significant impact on the species.

Nonlisted Vernal Pool Invertebrates

This section describes the effects of Alternative 4, including water conveyance facilities construction and implementation of other conservation components, on nonlisted vernal pool invertebrates that are not covered by the Plan (Blennosperma vernal pool andrenid bee, hairy water flea, Ricksecker's water scavenger beetle, curved-foot hygrotus beetle, molestan blister beetle). Little is known about the range of these species so it is assumed that they have potential to occur in the same areas described by the vernal pool crustacean modeled habitat. That habitat model consists of two layers: vernal pool complex, which consists of vernal pools and uplands that display characteristic vernal pool and swale visual signatures that have not been significantly affected by agricultural or development practices; and degraded vernal pool complex, which consists of low-value ephemeral habitat ranging from areas with vernal pool and swale visual signatures that display clear evidence of significant disturbance due to plowing, disking, or leveling to areas with clearly artificial basins such as shallow agricultural ditches, depressions in fallow fields, and areas of compacted soils in pastures. For the purpose of the effects analysis, vernal pool complex is categorized as high-value and degraded vernal pool complex is categorized as low-value for these species.

Construction and restoration associated with Alternative 4 conservation measures would result in permanent losses of habitat for nonlisted vernal pool invertebrates as indicated in Table 12-4-15. The majority of the losses would take place over an extended period of time as tidal marsh is restored in the Plan Area. Full implementation of the BDCP would restore or create habitat such that there is no net loss of vernal pool acreage and protect of at least 600 acres of vernal pool complex in either Conservation Zones 1, 8, or 11, primarily in core vernal pool recovery areas (Table 12-4-15). As explained below, with the restoration or protection of these amounts of habitat, impacts on nonlisted vernal pool invertebrates would not be adverse for NEPA purposes and would be less-than significant for CEQA purposes.

Table 12-4-15. Changes in Nonlisted Vernal Pool Invertebrate Habitat Associated with Alternative 4 (acres)[a]

	Conservation Measure[b]	Habitat Type	Permanent		Temporary		Periodic[d]	
			NT	LLT	NT	LLT	Yolo	Floodplain
Habitat Affected[c]	CM1[g]	High-value (vernal pool complex)	3	3	0	NA	NA	NA

		Low-value (degraded vernal pool complex)	0	0	0	NA	NA	NA
	Total Impacts CM1		**3**	**3**	**0**			
	CM2–CM18[g]	High-value (vernal pool complex)	0	89	0	0	0–4	0
		Low-value (degraded vernal pool complex)	201	417	0	0	0	0
	Total Impacts CM2–CM18		**201**	**506**	**0**	**0**	**0–4**	**0**
	TOTAL IMPACTS		**204**	**509**	**0**	**0**	**0–4**	**0**
Habitat Restored/ Created[e]	CM9 Vernal Pool and Alkali Seasonal Wetland Complex Restoration		40	67	NA	NA	NA	NA
	Total Restoration/Creation		**40**	**67**				
Habitat Protected[f]	CM3 Natural Communities Protection and Restoration		400	600	NA	NA	NA	NA
	Total Protection		**400**	**600**				

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late long-term timeframes.
[b] See discussion below for a description of applicable CMs.
[c] LLT acreages are a summation of effects that would occur in the near-term, early long-term and late long-term timeframes. The LLT acreages represent the total amount of habitat that would be affected over the 50-year life of the BDCP and do not reflect habitat increases that would result from restoration, creation and protection activities.
[d] Periodic effects were estimated for the late long-term only. Yolo periodic impacts are presented as a range based on different flow regimes at the proposed notch in Fremont Weir.
[e] Vernal pool complex restoration objectives requires no net loss of wetted acres. Actual restoration vernal pool complex acreage will depend on the amount lost and the density of wetted acres in the restored areas. Restoration numbers reflect that required with maximum allowable impacts and assumed density of wetted area of 15%.
[f] Protected habitat acreages represent planned conservation activities that would be implemented over the lifetime of the BDCP (see BDCP Chapter 3, *Conservation Strategy*, for specifics).
[g] Include indirect conversion impacts
NT = near-term
LLT = late long-term
NA = not applicable

Impact BIO-38: Loss or conversion of habitat for and direct mortality of nonlisted vernal pool invertebrates

Alternative 4 conservation measures would result in the direct, permanent loss of up to 372 acres of low-value vernal pool habitat based on the hypothetical footprints for tidal natural communities restoration (CM4). In addition, the conservation measures could result in the indirect conversion due to hydrologic alteration of an additional 137 acres of vernal pool habitat (92 acres of vernal pool complex and 45 acres of degraded vernal pool complex) from conveyance construction (CM1) and based on the hypothetical footprints for tidal restoration (CM4). Construction of the water conveyance facilities and restoration activities may result in the modification of hardpan and changes to the perched water table, which could lead to alterations in the rate, extent, and duration of inundation of nearby vernal pool habitat. USFWS typically considers construction within 250 feet of vernal pools to constitute an indirect effect unless more detailed information is provided to further refine the limits of any such effects. For the purposes of this analysis, the 250-foot buffer was applied to the water conveyance facilities work areas where surface and subsurface disturbance activities would take place and to restoration hypothetical footprints. Habitat enhancement and management activities (CM11), which include disturbance or removal of nonnative vegetation, could result in local adverse habitat effects.

Because the estimates of habitat loss resulting from tidal inundation are based on projections of where restoration may occur, actual effects are expected to be lower because sites would be selected and restoration projects designed to minimize or avoid effects on the vernal pools. As specified in the BDCP, the BDCP Implementation Office would ensure that tidal restoration projects and other covered activities would be designed such that no more than a total of 10 wetted acres of vernal pools are permanently lost and that no more than 20 wetted acres of vernal pools are indirectly affected by BDCP covered activities. The term *wetted acres* refers to an area that would be defined by the three parameter wetland delineation method used by the U.S. Army Corps of Engineers to determine the limits of a wetland using, which involves an evaluation of wetland soil, vegetation, and hydrology characteristics. This acreage differs from vernal pool complex acreages in that a vernal pool complex is composed of individual wetlands (vernal pools) and those upland areas that are in between and surrounding them, which provide the supporting hydrology (surface runoff and groundwater input), organic and nutrient inputs, and refuge for the terrestrial phase of some vernal pool species.

A summary statement of the combined impacts and NEPA and CEQA conclusions follows the individual conservation measure discussions.

- *CM1 Water Facilities and Operation*: Construction of Alternative 4 conveyance facilities could result in the indirect conversion of 3 acres of vernal pool complex in the vicinity of the proposed Byron Tract Forebay and associated borrow/spoils area. There are no records of these nonlisted vernal pool invertebrates at this location (California Department of Fish and Game 2012).

  Alternative 4 with the east-west transmission line option would result in approximately 14 more acres of effects, which include 1 acre of permanent loss, 1 acres of temporary impact, and 12 more acres of potential indirect conversion. Also, these effects would be to high-value vernal pool habitat located within a portion of the Cosumnes Preserve.

- *CM4 Tidal Natural Communities Restoration:* Tidal natural communities restoration would result in the permanent loss of approximately 372 acres of low-value vernal pool habitat, which consists of degraded vernal pool complex. The BDCP describes degraded vernal pool complex as areas of low-value ephemeral habitat ranging from areas with vernal pool and swale visual signatures that display clear evidence of significant disturbance due to plowing, disking, or leveling to areas with clearly artificial basins such as shallow agricultural ditches, depressions in fallow fields, and areas of compacted soils in pastures. The actual density of vernal pools or other aquatic features in these areas is unknown but a 2012 review of Google Earth imagery of these habitats found that they appear to generally have low densities. However, areas mapped as degraded vernal pool complex may still provide habitat for vernal pool species as evidenced by records of vernal pool fairy shrimp, vernal pool tadpole shrimp, and California linderiella occurring in degraded vernal pool complex in CZ 4 (California Department of Fish and Game 2012). So though degraded vernal pool complexes may not represent botanically diverse vernal pools they still can provide habitat for vernal pool invertebrates and thus the loss of 372 acres of degraded vernal pool complex may result in the loss of occupied vernal pool invertebrate habitat. In addition, tidal restoration could result in the indirect conversion of 134 acres of vernal pool habitat, which consist of 89 acres of high-value and 45 acres of low-value habitat. No records of vernal pool invertebrates would be directly impacted.

- *CM11 Natural Communities Enhancement and Management*: As described in the BDCP, restoration/creation of vernal pools to achieve no net loss and the protection of 600 acres of vernal pool complex would benefit vernal pool invertebrates (Table 12-4-15). A variety of habitat management actions included in CM11 that are designed to enhance wildlife values in BDCP-protected habitats may result in localized ground disturbances that could temporarily affect vernal pool invertebrate habitat. Ground-disturbing activities, such as removal of nonnative vegetation and road and other infrastructure maintenance, are expected to have minor effects on vernal pool invertebrate habitat and are expected to result in overall improvements to and maintenance of vernal pool habitat values over the term of the BDCP. These effects cannot be quantified, but are expected to be minimal and would be avoided and minimized by the AMMs listed below.

The following paragraphs summarize the combined effects discussed above and describe other BDCP conservation actions that offset or avoid these effects. NEPA and CEQA impact conclusions are also included. Table 12-4-16 was prepared to further analyze BDCP using wetted acres of vernal pools in order to compare to the effects of this alternative with the effect limits established in BDCP Chapter 3, Section 3.3, *Biological Goals and Objectives*, which are measured in wetted acres of vernal pools. Wetted acres were estimated by using the BDCP's assumption that vernal pool complexes and degraded vernal pool complexes would have a 15% density of vernal pools (i.e., of 100 acres of vernal pool complex 15 acres would constitute vernal pools and the remaining 85 acres supporting uplands). Based on an informal evaluation of aerial photographs of the Plan Area it is likely that the actual densities within the Plan Area are somewhere between 5% and 10%, but the 15% density value was chosen as a conservative estimate for determining effects.

Table 12-4-16. Estimated Effects on Wetted Vernal Pools Associated with Alternative 4 (acres)[a]

		Direct Loss		Indirect Conversion	
		NT	LLT	NT	LLT
BDCP Impact Limit		5	10	10	20
Alternative 1C Impact [a]	CM1	0	0	0.5	0.5
	CM4[b]	30	56	11	20
Total		**30**	**56**	**12**	**21**

[a] These acreages were generated by assuming that the modeled habitat identified in Table 12-4-15 has densities of wetted vernal pools at 15%. The direct effects numbers include permanent and temporary impacts.
[b] These impacts are based on the hypothetical restoration footprints and will likely be lower based on the BDCP's commitment to minimize and avoid effects on vernal pool habitat as much as practicable.

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the effects of construction would not be adverse under NEPA and would be less than significant under CEQA. Table 12-4-15 above lists the impacts on other vernal pool invertebrate habitat that are based on the natural community mapping done within the study area. The impacts from tidal natural communities restoration (CM4) are based on hypothetical footprints and do not reflect actual impacts on vernal pool habitat considering the BDCP's commitment to design restoration projects to minimize or avoid effects on vernal pools. As seen in Table 12-4-16, the effects of CM1 alone would be well within the near-term limits. The BDCP states that covered activities would not result in more than 5 wetted acres of direct loss and no more than 10 wetted acres of indirect effects on vernal pools in the near-term. As seen in Table 12-4-16, Alternative 4 would not meet the Plan's near-term biological goals and objectives for direct and indirect effects unless near-term tidal restoration projects are designed to ensure that they do not exceed these impact limits.

Typical NEPA and CEQA project-level mitigation ratios for vernal pools affected by CM1 would be 1:1 for restoration and 2:1 for protection. Typically, indirect impacts are mitigated by protecting vernal pools at a 2:1 ratio. Using these typical ratios would indicate that 1 wetted acre of vernal pool (or 7 acres of vernal pool complex using the 15% density) should be protected to mitigate for the CM1 indirect effects on vernal pool habitat. If impacts on wetted vernal pools from tidal restoration stay within the BDCP near-term effect limit, the near-term effects of tidal restoration would require up to 5 acres of vernal pool restoration and up to 29 wetted acres of vernal pool protection (or 193 acres of vernal pool complex protection using the 15% density assumption).

Alternative 4 with the east-west transmission line would require 28 more acres of vernal pool complex protection and approximately 0.3 wetted acre of additional vernal pool restoration due to impacts of vernal pool complex within the Cosumnes Preserve.

The BDCP has committed to near-term goal of protecting at least 400 acres of vernal pool complex by protecting at least 2 wetted acres of vernal pools for each wetted acre directly or indirectly affected. The BDCP has also committed to restoring/creating vernal pools such that there is no net loss of vernal pool acreage. The amount of restoration would be determined during implementation based on the following criteria.

- If restoration is completed (i.e., restored natural community meets all success criteria) prior to impacts, then 1.0 wetted acre of vernal pools would be restored for each wetted acre directly affected (1:1 ratio).
- If restoration takes place concurrent with impacts (i.e., restoration construction is completed, but restored habitat has not met all success criteria, prior to impacts occurring), then 1.5 wetted acres of vernal pools would be restored for each wetted acre directly affected (1.5:1 ratio).

The species-specific biological goals and objectives would also inform the near-term protection and restoration efforts. These Plan goals represent performance standards for considering the effectiveness of restoration actions. The acres of protection and restoration contained in the near-term Plan goals would keep pace with the loss of habitat and effects on other vernal pool invertebrate habitat.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training*, *AMM2 Construction Best Management Practices and Monitoring, AMM3 Stormwater Pollution Prevention Plan*, *AMM4 Erosion and Sediment Control Plan*, *AMM5 Spill Prevention, Containment, and Countermeasure Plan*, *AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan*, and *AMM10 Restoration of Temporarily Affected Natural Communities*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas. The AMMs are described in detail in BDCP Appendix 3.C.

The near-term effects of Alternative 4 on nonlisted vernal pool invertebrates would not be adverse under NEPA.

Late Long-Term Timeframe

The BDCP states that covered activities would not result in more than 10 wetted acres of direct loss and no more than 20 wetted acres of indirect conversion effects on vernal pools by the late long-term. As seen in Table 12-4-16, the effects of CM1 alone would be well within the near-term limits but overall Alternative 4 would not meet the Plan's late long-term biological goals and objectives for direct and indirect effects unless near-term tidal restoration projects are designed to ensure that that they do not exceed these impact limits.

The Plan has committed to late long-term goal of protecting at least 600 acres of vernal pool complex in either Conservation Zones 1, 8, or 11, primarily in core vernal pool recovery areas (CM3 and CM9) by protecting at least 2 wetted acres of vernal pools protected for each wetted acre directly or indirectly affected. The Plan also includes a commitment to restore or create vernal pools such that the Plan results in no net loss of vernal pool acreage. The protection and restoration would be achieved using the criteria presented above as well as by following the other specific biological goals and objectives, which include:

- Increasing the size and connectivity of protected vernal pool complexes (VPNC1.3)
- Protecting the range of inundation characteristics that are currently represented by vernal pool throughout the Plan Area (VPNC1.4)
- Protecting at least one currently unprotected occurrence of conservancy fairy shrimp (VPC1.1)

The effects on other vernal pool invertebrate habitat from Alternative 4 would represent an adverse effect as a result of habitat modification of a special-status species and potential for direct mortality in the absence of other conservation actions. However, habitat protection, restoration, and management and enhancement associated with CM3, CM9, and CM11, guided by species-specific goals and objectives, and AMM1–AMM6, AMM10, and AMM12, which would be in place throughout the time period of construction, the effects of Alternative 4 as a whole on nonlisted vernal pool invertebrates would not be adverse under NEPA.

CEQA Conclusion:

Near-Term Timeframe

Because the water conveyance facilities construction (CM1) is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the impacts of construction would be less than significant under CEQA. Table 12-4-15 above lists the impacts on vernal pool habitat that is based on the natural community mapping done within the study area. The impacts from tidal natural communities restoration (CM4) are based on hypothetical footprints and do not reflect actual impacts on vernal pool habitat considering the BDCP's commitment to design restoration projects to minimize or avoid effects on vernal pools. As seen in Table 12-4-16, the effects of CM1 alone would be well within the near-term limits. The BDCP states that covered activities would not result in more than 5 wetted acres of direct loss and no more than

10 wetted acres of indirect effects on vernal pools in the near-term. As seen in Table 12-4-16, Alternative 4 would not meet the Plan's near-term biological goals and objectives for direct and indirect effects unless near-term tidal restoration projects are designed to ensure that they do not exceed these impact limits.

Typical NEPA and CEQA project-level mitigation ratios for vernal pools affected by CM1 would be 1:1 for restoration and 2:1 for protection. Typically, indirect impacts are mitigated by protecting vernal pools at a 2:1 ratio. Using these typical ratios would indicate that 1 wetted acre of vernal pool (or 7 acres of vernal pool complex using the 15% density) should be protected to mitigate for the CM1 indirect effects on other vernal pool invertebrate habitat. If impacts on wetted vernal pools from tidal restoration stay within the BDCP near-term effect limit, the near-term effects of tidal restoration would require up to 5 acres of vernal pool restoration and up to 29 wetted acres of vernal pool protection (or 193 acres of vernal pool complex protection using the 15% density assumption).

Alternative 4 with the east-west transmission line would require 28 more acres of vernal pool complex protection and approximately 0.3 wetted acre of additional vernal pool restoration due to impacts of vernal pool complex within the Cosumnes Preserve.

The BDCP has committed to near-term goal of protecting at least 400 acres of vernal pool complex by protecting at least 2 wetted acres of vernal pools for each wetted acre directly or indirectly affected. The BDCP has also committed to restoring/creating vernal pools such that there is no net loss of vernal pool acreage. The amount of restoration would be determined during implementation based on the following criteria.

- If restoration is completed (i.e., restored natural community meets all success criteria) prior to impacts, then 1.0 wetted acre of vernal pools would be restored for each wetted acre directly affected (1:1 ratio).
- If restoration takes place concurrent with impacts (i.e., restoration construction is completed, but restored habitat has not met all success criteria, prior to impacts occurring), then 1.5 wetted acres of vernal pools would be restored for each wetted acre directly affected (1.5:1 ratio).

The species-specific biological goals and objectives would also inform the near-term protection and restoration efforts. These Plan goals represent performance standards for considering the effectiveness of restoration actions. The acres of protection and restoration contained in the near-term Plan goals would keep pace with the loss of habitat and effects on nonlisted vernal pool invertebrates.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training*, *AMM2 Construction Best Management Practices and Monitoring, AMM3 Stormwater Pollution Prevention Plan*, *AMM4 Erosion and Sediment Control Plan*, *AMM5 Spill Prevention, Containment, and Countermeasure Plan*, *AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan*, and *AMM10 Restoration of Temporarily Affected Natural Communities*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas. The AMMs are described in detail in BDCP Appendix 3.C.

The natural community restoration and protection activities are expected to be concluded in the first 10 years of Plan implementation, which is close enough in time to the occurrence of impacts on constitute adequate mitigation for CEQA purposes. These commitments, implemented together with the AMMs and biological goals and objectives, are more than sufficient to support the conclusion that the near-term effects of Alternative 4 would be less than significant under CEQA. Alternative 4 with the east-west transmission line alignment would also be less than significant under CEQA.

Late Long-Term Timeframe

The BDCP states that covered activities would not result in more than 10 wetted acres of direct loss and no more than 20 wetted acres of indirect effects on vernal pools by the late long-term. As seen in Table 12-4-16, the impacts of CM1 alone would be well within the near-term limits but overall Alternative 4 would not meet the Plan's late long-term biological goals and objectives for direct and indirect effects unless near-term tidal restoration projects are designed to ensure that that they do not exceed these impact limits.

The Plan has committed to late long-term goal of protecting at least 600 acres of vernal pool complex in either Conservation Zones 1, 8, or 11, primarily in core vernal pool recovery areas (CM3 and CM9) by protecting at least 2 wetted acres of vernal pools protected for each wetted acre directly or indirectly affected. The Plan also includes a commitment to restore or create vernal pools such that the Plan results in no net loss of vernal pool acreage. The protection and restoration would be achieved using the criteria presented above as well as by following the other specific biological goals and objectives, which include:

- Increasing the size and connectivity of protected vernal pool complexes (VPNC1.3)
- Protecting the range of inundation characteristics that are currently represented by vernal pool throughout the Plan Area (VPNC1.4)
- Protecting at least one currently unprotected occurrence of conservancy fairy shrimp (VPC1.1)

The effects on other vernal pool invertebrate habitat from Alternative 4 would represent an adverse effect as a result of habitat modification of a special-status species and potential for direct mortality in the absence of other conservation actions. However, habitat protection, restoration, and management and enhancement associated with CM3, CM9, and CM11, guided by species-specific goals and objectives, and AMM1–AMM6, AMM10, and AMM12 would be in place throughout the time period any construction activity would be occurring. Alternative 4 over the term of the BDCP would not result in a substantial adverse effect through habitat modifications and would not substantially reduce the number or restrict the range of nonlisted vernal pool invertebrates. Therefore, Alternative 4 would have a less-than-significant impact on nonlisted vernal pool invertebrates. Alternative 4 with the east-west transmission line alignment would also be less-than significant under CEQA.

Impact BIO-39: Indirect effects of plan implementation on nonlisted vernal pool invertebrates

Construction and maintenance activities associated with water conveyance facilities, and restoration actions could indirectly affect nonlisted vernal pool invertebrates and their habitat in the vicinity of construction and restoration areas, and maintenance activities. These potential adverse effects would be minimized or avoided through AMM1–AMM6, and AMM10, which would be in effect throughout the Plan's construction phase.

Water conveyance construction and restoration activities could indirectly affect nonlisted vernal pool invertebrates and their habitat in the vicinity of construction areas. Ground-disturbing activities, stockpiling of soils, and maintenance and refueling of heavy equipment could result in the inadvertent release of sediment and hazardous substances into this habitat. These potential effects would be avoided and minimized through AMM1–AMM6, which would be in effect throughout the Plan's construction phase. Nonlisted vernal pool invertebrates and their habitat could be periodically indirectly affected by maintenance activities at water conveyance facilities. Embankment maintenance activities around Byron Tract and Clifton Court Forebays could result in the inadvertent discharge of sediments and hazardous materials into vernal pool habitat that occurs along the southern and western boundaries of the forebays. These potential effects would be avoided and minimized through AMM1–AMM6, which would be in effect throughout the term of the Plan.

CEQA Conclusion: Construction and maintenance activities associated with water conveyance facilities, and restoration actions could indirectly impact nonlisted vernal pool invertebrates and their habitat in the vicinity of construction and restoration areas, and maintenance activities. These potential impacts would be minimized or avoided through AMM1–AMM6, AMM10, and AMM12, which would be in effect throughout the Plan's construction phase. These impacts would be less-than significant under CEQA.

Impact BIO-40: Periodic effects of inundation of nonlisted vernal pool invertebrates' habitat as a result of implementation of conservation components

Flooding of the Yolo Bypass under *CM2 Yolo Bypass Fisheries Enhancement* would periodically affect 0 to 4 acres of modeled habitat for nonlisted vernal pool invertebrates (Table 12-4-12). There would be no periodic effects from *CM5 Seasonally Inundated Floodplain Restoration*

BDCP Appendix 5J, *Effects on Natural Communities, Wildlife, and Plants*, describes the methods used to estimate periodic inundation effects in the Yolo Bypass. Based on this method, periodic inundation could affect nonlisted vernal pool invertebrates occupying areas ranging from 0 acres of habitat during most notch flows to an estimated 4 acres during a notch flow of 6,000 cfs. BDCP-associated inundation of areas that would not otherwise have been inundated is expected to occur in no more than 30% of all years, because Fremont Weir is expected to overtop the remaining 70% of all years, and during those years notch operations will not typically affect the maximum extent of inundation. In more than half of all years under existing conditions, an area greater than the BDCP-related inundation area already inundates in the bypass. Yolo Bypass flooding is expected to have a minimal effect on nonlisted vernal pool invertebrates and would thus not be adverse under NEPA.

CEQA Conclusion: Alternative 4 would periodically inundate at most 4 acres of nonlisted vernal pool invertebrates' habitat during the maximum flows over the Fremont Weir. The periodic inundation is not anticipated to result in a conversion of nonlisted vernal pool invertebrates' habitat into different wetland habitat. BDCP-associated inundation of areas that would not otherwise have been inundated is expected to occur in no more than 30% of all years, because Fremont Weir is expected to overtop the remaining 70% of all years, and during those years notch operations will not typically affect the maximum extent of inundation. In more than half of all years under existing conditions, an area greater than the BDCP-related inundation area already inundates in the bypass. Yolo Bypass flooding is expected to have a minimal effect on nonlisted vernal pool invertebrates and would thus result in less-than-significant impacts on the species.

Sacramento and Antioch Dunes Anthicid Beetles

This section describes the effects of Alternative 4, including water conveyance facilities construction and implementation of other conservation components, on Sacramento and Antioch Dunes anthicid beetles. Potential habitat in the study area includes the inland dune scrub at Antioch Dunes NWR, sand bars along the Sacramento and San Joaquin Rivers, and sandy dredge spoil piles (California Department of Fish and Game 2006c and 2006d).

The construction, and operations and maintenance of the water conveyance facilities under Alternative 4 would not likely affect Sacramento and Antioch Dunes anthicid beetles. The construction of the water conveyance structure and associated infrastructure would generally avoid affects to channel margins where sand bars are likely to form. Conveyance construction would not affect inland dune scrub habitat at Antioch Dunes NWR. No dredge spoil areas that could potentially be occupied by Sacramento anthicid beetle were identified within conveyance facilities footprints during a review of Google Earth imagery. Also, a review of the locations of the Alternative 4 water intake facilities on aerial imagery did not reveal any sandbars along the channel margins. These portions of the Sacramento River have steep, riprap lined channel banks that are likely not conducive to the formation of sandbars.

Implementation of BDCP restoration based conservation measures could affect habitat for Sacramento and Antioch Dunes anthicid beetles. Both species are known to utilize interior sand dunes and sandbar habitat. The only interior sand dune habitat within the Plan Area is at Antioch Dunes, which would not be impacted by the Alternative 4 conservation measures. Both species are known to occur along the Sacramento River and San Joaquin Rivers. The implementation of BDCP restoration actions, and other covered activities could affect habitat for Sacramento and Antioch Dunes anthicid beetles along channels throughout the Plan Area; however the extent of these habitats in the Plan Area is unknown because these areas were not identified at the scale of mapping done within the study area. Because of current and historic channel modifications (channel straightening and dredging) and levee construction throughout the Delta, sandbar habitat is likely very limited and restricted to channel margins. The implementation of *CM4 Tidal Natural Communities Restoration*, *CM5 Seasonally Inundated Floodplain Restoration*, and *CM6 Channel Margin Enhancement* could impact sandbar habitat along the river channels and possibly sandy, dredge piles on Delta islands.

Over the term of the BDCP, Alternative 4 would likely result in beneficial effects on Sacramento and Antioch Dunes anthicid beetles. Alternative 4 conservation measures would generally increase opportunities for the formation of sandbars in the Plan Area, in particular from seasonally inundated floodplain restoration (CM5), channel margin habitat enhancement (CM6), and riparian habitat restoration (CM7). These measures would improve shoreline conditions by creating benches along levees, shallow habitat along margins and in floodplains, and increasing shoreline vegetation, all of which would likely contribute to the formation of sandbars along Delta river channels where these measures would be implemented. Increasing the structural diversity of Delta river channel margins and floodplains would create opportunities for sand to be deposited and for sandbars to subsequently form. As explained below, potential impacts on Sacramento and Antioch Dunes anthicid beetle would not be adverse for NEPA purposes and would be less than significant for CEQA purposes. Alternative 4 with the east-west transmission line alignment would have the same effects as Alternative 4 and thus would also not result in adverse effects under NEPA and would be less than significant under CEQA.

Table 12-4-17. Changes in Sacramento and Antioch Dunes Anthicid Beetles' Habitat Associated with Alternative 4 (acres)[a]

Conservation	Habitat Type	Permanent	Temporary	Periodic[d]

	Measure[b]	NT	LLT	NT	LLT	Yolo	Floodplain
Habitat Affected[c]	CM1	--	--	--	--	NA	NA
		--	--	--	--	NA	NA
	Total Impacts CM1	**--**	**--**	**--**	**--**	**NA**	**NA**
	CM2–CM18	--	--	--	--	--	--
		--	--	--	--	--	--
	Total Impacts CM2–CM18	**--**	**--**	**--**	**--**	**--**	**--**
	TOTAL IMPACTS	**--**	**--**	**--**	**--**	**--**	**--**
Habitat Restored/ Created[e]	CM3 grassland restoration	--	--	NA	NA	NA	NA
	Total Restoration/ Creation	**--**	**--**				
Habitat Protected[e]	CM3 grassland restoration	--	--	NA	NA	NA	NA
	Total Protection	**--**	**--**				

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late long-term timeframes.

[b] See discussion below for a description of applicable CMs.

[c] LLT acreages are a summation of effects that would occur in the near-term, early long-term and late long-term timeframes. The LLT acreages represent the total amount of habitat that would be affected over the 50-year life of the BDCP and do not reflect habitat increases that would result from restoration, creation and protection activities.

[d] Periodic effects were estimated for the late long-term only. Yolo periodic impacts are presented as a range based on different flow regimes at the proposed notch in Fremont Weir.

[e] Restored/created and protected habitat acreages represent planned conservation activities that would be implemented over the lifetime of the BDCP (see BDCP Chapter 3, *Conservation Strategy*, for specifics).

NT = near-term

LLT = late long-term

NA = not applicable

Impact BIO-41: Loss or conversion of habitat for and direct mortality of Sacramento and Antioch Dunes anthicid beetles

Implementation of Alternative 4 conservation measures could potentially affect Sacramento and Antioch Dunes anthicid beetles and their habitat. As mentioned above, the extent of this habitat in the study area is unknown but it is assumed that sand bars likely occur along to some degree along the Sacramento and San Joaquin Rivers and that some islands in the Delta may contain sandy dredge spoil piles. A review of Google Earth imagery in the north Delta did identify three general areas that appear to have accumulations of sandy soils (with some vegetation), possibly from dredge disposal, are Decker Island, the western portion of Bradford Island, and the southwestern tip of Grand Island. A review of Google Earth imagery in the south Delta did identify sandbar habitat along the San Joaquin River from the southern end of the Plan Area downstream to an area just north of its crossing of I-5. An additional area along Paradise Cut was identified just north of I-5. Conservation measures that could result in impacts on Sacramento and Antioch Dunes anthicid beetles are tidal habitat restoration (CM4), floodplain restoration (CM5), and channel margin enhancement (CM6). In addition, maintenance activities associated with the long-term operation of the water conveyance facilities and other BDCP physical facilities could degrade or eliminate habitat for Sacramento and Antioch Dunes anthicid beetles. Each of these individual activities is described below. A summary statement of the combined impacts and NEPA and CEQA conclusions follows the individual conservation measure discussions.

- *CM4 Tidal Natural Communities Restoration*: Tidal natural communities restoration could potentially impact the areas of sandy soils identified from aerial photographs on Decker Island, the western portion of Bradford Island, and on the southwestern tip of Grand Island because these areas fall within the West Delta Restoration Opportunity Area (ROA). The West Delta ROA has been identified in the BDCP (BDCP Chapter 3 *Conservation Strategy*, Section 3.4.4) as providing opportunities for creating subtidal aquatic and tidal marsh habitats. The methods and techniques identified in BDCP Section 3.4.4.3.3 that may be used for tidal restoration include the recontouring of lands so that they have elevations suitable for the establishment of marsh plains and the eventual breaching of levees. There are three CNDDB records of Sacramento anthicid beetle (just north of Rio Vista, one just south of Rio Vista along the west shore of the Sacramento River, and one on Grand Island) and one CNDDB record of Antioch Dunes anthicid beetle (just north of Rio Vista) that fall within the West Delta ROA (California Department of Fish and Game 2012l). Tidal restoration actions in the West Delta ROA may eliminate potential habitat and impact occupied habitat of both Sacramento and Antioch Dunes anthicid beetles.
- *CM5 Seasonally Inundated Floodplain Restoration*: Seasonally inundated floodplain restoration could potentially impact areas with sandbars that were identified in a review of aerial photographs. The sandbars identified along the San Joaquin River and Paradise Cut are within the conceptual corridors (Corridor 4, 1b, and 2a) identified in Figure 3.4-7 of the BDCP. There are four CNDDB records for Sacramento anthicid beetle in the conceptual corridor along the San Joaquin River (California Department of Fish and Game 2012k). Floodplain restoration actions in these conceptual corridors could impact potential habitat for both these species and occupied habitat of Sacramento anthicid beetle.
- *CM6 Channel Margin Enhancement*: Channel margin enhancement could result in impacts on 20 miles of channel margin that could contain sandbars.

The following paragraphs summarize the combined effects discussed above and describe other BDCP conservation actions that offset or avoid these effects. NEPA and CEQA impact conclusions are also included.

Alternative 4 could result in substantial affects on Sacramento and Antioch Dunes anthicid beetles because all of the habitat identifiable from aerial photo review falls within either the West Delta ROA, which is being considered for tidal restoration (CM4), or within three of the conceptual corridors being considered for floodplain restoration (CM5). Furthermore, all seven of the records for Sacramento anthicid beetle within the study area fall within areas being considered for restoration (CM4 and CM5), which represent over half of the extant records for this species range wide (7 of 13), and the only extant record for Antioch Dunes anthicid beetle, which represent one of five extant records range wide, falls within the West Delta ROA that is just north of Rio Vista. These occurrences could be affected by restoration if these areas are chosen as restoration projects. However, over the term of the BDCP, implementation of conservation components would likely benefit Sacramento and Antioch Dunes anthicid beetles. Under Alternative 4, CM5, CM6, and CM7, would generally contribute to the formation of sandbar habitat in the Plan Area. These measures would improve shoreline conditions by creating benches along levees (CM6), creating shallow margin and floodplain habitat (CM5), and increasing shoreline vegetation (CM7), all of which would likely contribute to the formation of sandbars along Delta river channels where these measures would be implemented. Increasing the structural diversity of Delta river channel margins would create areas of slow water that would allow for sand to be deposited and for sandbars to subsequently form. Other factors relevant to effects on Sacramento and Antioch Dunes anthicid beetles are listed below.

- The actual extent of suitable and occupied habitat for these species in the plan is unknown.
- The sandbar habitat occupied by Sacramento anthicid beetle along the San Joaquin River would likely not be directly impacted where floodplain restoration occurs because the physical disturbance would be to adjacent levees and agricultural areas. Though these actions would change hydrologic conditions that could overtime remove the existing sandbars, the expanded floodplain would create conditions suitable for the formation of new and possibly larger sandbars.
- Floodplain restoration would be phased over a period of 30 years so that not all sandbar habitat within these areas would be affected at once. Furthermore, as floodplain restoration is being implemented new sandbar habitat would likely be forming prior and/or concurrent with future floodplain restoration projects that may affect sandbar habitat on the San Joaquin River and/or Paradise Cut.

The potential impacts on Sacramento and Antioch Dunes anthicid beetles associated with Alternative 4 as a whole would represent an adverse effect as a result of habitat modification of a special-status species and potential for direct mortality in the absence of other conservation actions. However, with implementation of restoration associated with CM5, CM6, and CM7, which would be phased throughout the time period when the impacts would be occurring, the effects of Alternative 4, and Alternative 4 with the east-west transmission line alignment, as a whole on Sacramento and Antioch Dunes anthicid beetles would not be adverse under NEPA.

CEQA Conclusion: Alternative 4 would impact Sacramento and Antioch Dunes anthicid beetles' habitat and could potentially impact seven occurrences of Sacramento anthicid beetle and one occurrence of Antioch Dunes anthicid beetle. However, over the term of the BDCP, implementation of conservation components would likely benefit Sacramento and Antioch Dunes anthicid beetles. BDCP conservation components, particularly conservation measures CM5, CM6, and CM7, would generally contribute to the formation of sandbar habitat in the Plan Area. Floodplain restoration (CM5) would be phased over a period of 30 years so that not all sandbar habitat within these areas would be affected at once. Furthermore, as floodplain restoration is being implemented new sandbar habitat would likely be forming prior and/or concurrent with future floodplain restoration projects that may affect sandbar habitat on the San Joaquin River and/or Paradise Cut.

Considering that floodplain (CM5), channel margin enhancement (CM6), and riparian restoration (CM7) would contribute to the replacement of and possible expansion of sandbar habitat in the Delta and be phased throughout the time period when the impacts would be occurring, the implementation of Alternative 4 as a whole would not result in a substantial adverse effect though habitat modification and would not substantially reduce the number or restrict the range of these species. Therefore, the alternative would have a less-than-significant impact on Sacramento and Antioch Dunes anthicid beetles. Alternative 4 with the east-west transmission line alignment would also have a less-than-significant impact on these species.

Delta Green Ground Beetle

Suitable habitat in the study area would be vernal pool complexes and annual grasslands in the general Jepson Prairie area. The construction, and operations and maintenance of the water conveyance facilities under Alternative 4 would not affect delta green ground beetle because the facilities and construction area are outside the known range of the species. Implementation of Alternative 4 could potentially affect delta green ground beetle through the protection of grasslands and vernal pool complex (CM3) in the vicinity of Jepson Prairie and the subsequent implementation of habitat enhancement and management actions (CM11) in these areas. In addition, tidal natural communities restoration (CM4) could result in potential impacts on delta green ground beetle and its habitat. Over the term of the BDCP, Alternative 4 would likely result in beneficial effects on delta green ground beetle through the protection of 2,000 acres of grassland in CZ1 (CM3) and the protection of 600 acres of vernal pool complex and up 10 wetted acres of vernal pool complex restoration, some of which could occur in CZ1 (CM3 and CM9). These areas could contain currently occupied habitat for delta green ground beetle and/or create conditions suitable for eventual range expansion. As explained below, potential impacts on delta green ground beetle would be adverse for NEPA purposes and would be significant for CEQA purposes. Mitigation Measure BIO-42 would reduce the effects under NEPA and reduce the impacts to a less-than-significant level under CEQA.

Alternative 4 with the east-west transmission line alignment would have the same potential effects and, thus, the same NEPA and CEQA conclusions described above.

Table 12-4-18. Changes in Delta Green Ground Beetle Habitat Associated with Alternative 4 (acres)[a]

	Conservation Measure[b]	Habitat Type	Permanent		Temporary		Periodic[d]	
			NT	LLT	NT	LLT	Yolo	Floodplain
Habitat Affected[c]	CM1		--	--	--	--	NA	NA
			--	--	--	--	NA	NA
	Total Impacts CM1		**--**	**--**	**--**	**--**	**NA**	**NA**
	CM2–CM18		--	--	--	--	--	--
			--	--	--	--	--	--
	Total Impacts CM2–CM18		**--**	**--**	**--**	**--**	**--**	**--**
	TOTAL IMPACTS		**--**	**--**	**--**	**--**	**--**	**--**
Habitat Restored/ Created[e]	CM3 grassland restoration		--	--	NA	NA	NA	NA
	Total Restoration/Creation		**--**	**--**				
Habitat Protected[e]	CM3 grassland restoration		--	--	NA	NA	NA	NA
	Total Protection		**--**	**--**				

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late long-term timeframes.

[b] See discussion below for a description of applicable CMs.

[c] LLT acreages are a summation of effects that would occur in the near-term, early long-term and late long-term timeframes. The LLT acreages represent the total amount of habitat that would be affected over the 50-year life of the BDCP and do not reflect habitat increases that would result from restoration, creation and protection activities.

[d] Periodic effects were estimated for the late long-term only. Yolo periodic impacts are presented as a range based on different flow regimes at the proposed notch in Fremont Weir.

[e] Restored/created and protected habitat acreages represent planned conservation activities that would be implemented over the lifetime of the BDCP (see BDCP Chapter 3, *Conservation Strategy*, for specifics).

NT = near-term
LLT = late long-term
NA = not applicable

Impact BIO-42: Loss or conversion of habitat for and direct mortality of delta green ground beetle

Alternative 4 conservation measures could result in the conversion of habitat and/or direct mortality to delta green ground beetle. Conservation measure that could affect delta green ground beetle include tidal natural communities habitat restoration (CM4) and habitat enhancement and management activities (CM11) in CZ1. CZ1 is the only portion of the Plan Area that contains occupied and potential habitat for delta green ground beetle. The range of the delta green ground beetle is currently believed to be generally bound by Travis Air Force Base to the west, Highway 113 to the east, Hay Road to the north, and Creed Road to the south (Arnold and Kavanaugh 2007; USFWS 2009). Further discussion of this potential effect is provided below, and NEPA and CEQA conclusions follow.

- *CM4 Tidal Natural Communities Restoration:* Tidal restoration in the Cache Slough ROA could result in the loss of delta green ground beetle habitat if restoration is planned in areas known to be or potentially occupied by the species. CM4 identifies at least 5,000 acres of freshwater tidal natural communities restoration in the Cache Slough ROA and Lindsey Slough and Calhoun Cut have been identified as areas suitable for restoration. Lindsey Slough is just west of Jepson Prairie and Calhoun Cut, which is off of Lindsey Slough (see Figure 12-1), goes into the general Jepson Prairie area and is adjacent to areas of potential habitat for delta green ground beetle. The tidal restoration methods and techniques identified in CM4 (see Section 3.4.4.3.3) includes excavating channels; modifying ditches, cuts, and levees to encourage tidal circulation; and scalping higher elevation areas to create marsh plains. These disturbances could affects delta green ground beetle through habitat modification, either directly or indirectly through hydrologic modifications, and/or result in direct mortality to the species.
- *CM11 Natural Communities Enhancement and Management* As described in *CM3 Natural Communities Protection and Restoration*, up to 2,000 acres of grasslands would be protected in CZ1 and a portion of the 600 acres of protection and possibly some of the up to 10 wetted acres of vernal pool restoration could also occur in CZ1. Potential effects from CM11 could include direct mortality to larvae and adults from the implementation of grassland management techniques, which may include livestock grazing, prescribed burning, and mowing. In addition to these grassland and vernal pool complex management actions, CM11 also includes guidelines and techniques for invasive plant control, which may include manual control (hand-pulling and digging), mechanical control (large equipment), and chemical control, though some of these methods would be restricted in areas where rare plants occur or in critical habitat for vernal pool species.

The protection of 2,000 acres of grassland in CZ1 (CM3) and the protection of 600 acres of vernal pool complex and up 10 wetted acres of vernal pool complex restoration, some of which could occur in CZ1 (CM3 and CM9) could benefit delta green ground beetle if these areas occur within the range of the species. The management of these grasslands and vernal pool complexes according to *CM11 Natural Communities Enhancement and Management* has a potential to affect this species. Direct mortality and/or the affects to delta green ground beetle habitat would be an adverse effect under NEPA. Implementation of mitigation measure BIO-42, *Avoid impacts on delta green ground beetle and its habitat*, would reduce this effect.

Alternative 4 with the east-west transmission line alignment would have the same potential effect on delta green ground beetle and thus would also result in an adverse effect under NEPA. Implementation of Mitigation Measure BIO-42 would also reduce this effect.

CEQA Conclusion: The implementation of grassland and vernal pool complex protection (CM3), tidal natural communities restoration (CM4), vernal pool restoration (CM9), and subsequent enhancement and management actions (CM11) could potentially impact delta green ground beetle. Tidal restoration projects around Calhoun Cut and possible Lindsey Slough could affect habitat and result in direct mortality to the species from excavating channels; modifying ditches, cuts, and levees to encourage tidal circulation; and scalping higher elevation areas to create marsh plains. Potential impacts from CM11 could include direct mortality to larvae and adults resulting from the implementation of grassland management techniques, which may include livestock grazing, prescribed burning, and mowing. In addition to these grassland and vernal pool complex management actions, CM11 also includes guidelines and techniques for invasive plant control, which may include manual control (hand-pulling and digging), mechanical control (large equipment), and chemical control, though some of these methods would be restricted in areas where rare plants occur and in critical habitat for vernal pool species. These actions could result in adverse effects through habitat modification and a possible reduction in the number of the species or restrict its range, and therefore result in potentially significant impacts on delta green ground beetle. Implementation of Mitigation Measure BIO-42, *Avoid impacts on delta green ground beetle and its habitat*, would reduce these potential impacts on a less-than-significant level.

Alternative 4 with the east-west transmission line alignment would have the same potential impacts and thus also result in potentially significant impacts on delta green ground beetle. Implementation of Mitigation Measure BIO-42 would reduce these potential impacts on a less-than-significant level.

Mitigation Measure BIO-42: Avoid impacts on delta green ground beetle and its habitat

As part of the development of tidal restoration plans and site-specific management plans on protected grasslands and vernal pool complexes, and the possible implementation of vernal pool restoration in the area of Jepson Prairie, the following measures will be implemented to avoid effects on delta green ground beetle.

- If restoration or protection is planned for the lands adjacent to Calhoun Cut and non-cultivated lands on the western side of Lindsey Slough, these area will be evaluated by a USFWS approved biologist for potential delta green ground beetle habitat (large playa pools, or other similar aquatic features, with low growing vegetation or bare soils around the perimeter). The biologist will have previous experience with identifying suitable habitat requirements for delta green ground beetle.
- Any suitable habitat identified by the biologist (with previous experience with delta green ground beetle) within the species current range will be considered potentially occupied and all ground disturbing covered activities in these areas will be avoided, which for the Plan Area is generally the area west of Highway 113.
- Any other areas identified as suitable habitat outside of the current range of the species will be surveyed by a biologist with previous experience in surveying for and identifying delta green ground beetle. No ground disturbing covered activities will occur in areas identified as occupied by delta green ground beetle.

- Based on the results of the habitat evaluations and surveys, site-specific restoration and management plans will be developed so that they don't conflict with the recovery goals for delta green ground beetle in the USFWS's 2005 *Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon* (U.S. Fish and Wildlife Service 2005). Plans will include measures to protect and manage for delta green ground beetle so that they continue to support existing populations or allow for future colonization.

Callippe Silverspot Butterfly

This section describes the effects of Alternative 4 on Callippe silverspot butterfly. Suitable habitats are typically in areas influenced by coastal fog with hilltops that support the specie's host-plant, Johnny jump-ups. Preferred nectar flowers used by adults include thistles, blessed milk thistle, and coyote wild mint. Other native nectar sources include hairy false goldenaster, coast buckwheat, mourning bride, and California buckeye. The construction, and operations and maintenance of the water conveyance facilities under Alternative 4 would not result in impacts on callippe silverspot butterfly or its habitat. If Cordelia Hills and Potrero Hills are identified for grassland protection opportunities as part of *CM3 Natural Communities Protection and Restoration* and the subsequent implementation of *CM11 Natural Communities Enhancement and Management,* could potentially affect callippe silverspot butterfly. Callippe silverspot butterfly has been documented in the western most portion of the Plan Area (CZ11) in the Cordelia Hills (LSA Associates 2009). Potential habitat for the species (grassy hills with *Viola pedunculata*) is present in the Potrero Hills, but it has not been observed there (EDAW 2005, California Department of Fish and Game 2012v). Though CZ11 has been identified as potential area for grassland restoration in *CM8 Grassland Natural Community Restoration,* the primary goal there is to restore small patches of grassland to connect to Jepson Prairie and/or the restoration of upland grasses adjacent to tidal brackish emergent wetland in Suisun Marsh, both of which would not be areas suitable for callippe silverspot butterfly. The full implementation of BDCP would protect up to 2,000 acres of grassland in CZ11 (*CM3 Natural Communities Protection and Restoration*), some of which may contain habitat for callippe silverspot butterfly. As explained below, potential impacts on callippe silverspot would be adverse for NEPA purposes and would be significant for CEQA purposes. Mitigation Measure BIO-43 would reduce the effects under NEPA and reduce the impacts on less-than significant under CEQA.

Alternative 4 with the east-west transmission line alignment would have the same potential effects and thus same NEPA and CEQA conclusions described above.

Table 12-4-19. Changes in Callippe Silverspot Butterfly Habitat Associated with Alternative 4 (acres)[a]

	Conservation Measure[b]	Habitat Type	Permanent		Temporary		Periodic[d]	
			NT	LLT	NT	LLT	Yolo	Floodplain
Habitat Affected[c]	CM1		--	--	--	--	NA	NA
			--	--	--	--	NA	NA
	Total Impacts CM1		**--**	**--**	**--**	**--**	**NA**	**NA**
	CM2–CM18		--	--	--	--	--	--
			--	--	--	--	--	--
	Total Impacts CM2–CM18		**--**	**--**	**--**	**--**	**--**	**--**
	TOTAL IMPACTS		**--**	**--**	**--**	**--**	**--**	**--**
Habitat Restored/	CM3 grassland restoration		--	--	NA	NA	NA	NA
	Total Restoration/Creation		**--**	**--**				

Created[e] Habitat	CM3 grassland restoration	--	NA	NA	NA	NA
Protected[e]	**Total Protection**	--				

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late long-term timeframes.

[b] See discussion below for a description of applicable CMs.

[c] LLT acreages are a summation of effects that would occur in the near-term, early long-term and late long-term timeframes. The LLT acreages represent the total amount of habitat that would be affected over the 50-year life of the BDCP and do not reflect habitat increases that would result from restoration, creation and protection activities.

[d] Periodic effects were estimated for the late long-term only. Yolo periodic impacts are presented as a range based on different flow regimes at the proposed notch in Fremont Weir.

[e] Restored/created and protected habitat acreages represent planned conservation activities that would be implemented over the lifetime of the BDCP (see BDCP Chapter 3, *Conservation Strategy*, for specifics).

NT = near-term

LLT = late long-term

NA = not applicable

Impact BIO-43: Loss or conversion of habitat for and direct mortality of Callippe silverspot butterfly

Alternative 4 conservation measures could result in the conversion of habitat and/or direct mortality to Callippe silverspot butterfly. Only one conservation measure was identified as potentially affecting Callippe silverspot butterfly, *CM11 Natural Communities Enhancement and Management*, which could result in the disturbance of Callippe silverspot butterfly habitat if such areas are acquired as part of grassland protection under *CM3 Natural Communities Protection and Restoration*. Further discussion of this potential effect is provided below and NEPA and CEQA conclusions follow.

As described in *CM3 Natural Communities Protection and Restoration*, up to 2,000 acres of grasslands would be protected in CZ 11. If areas chosen for protection include Cordelia Hills or Potrero Hills, where there is known and potential habitat, respectively, then grassland enhancement and management actions could affect the Callippe silverspot butterfly. Potential effects from CM11 could include the loss of larval host and nectar sources and direct mortality to larvae and adults from the installation of artificial nesting burrows and structures and the implementation of grassland management techniques, which may include livestock grazing, prescribed burning, and mowing. In addition to these grassland management actions, CM11 also includes guidelines and techniques for invasive plant control, which may include manual control (hand-pulling and digging), mechanical control (large equipment), and chemical control. Several of the preferred nectar sources are thistles, some of which have been identified by the California Invasive Plant Council as having limited to moderate ecological impacts (California Invasive Plant Council 2006).

The protection of 2,000 acres of grassland within CZ11 could benefit Callippe silverspot butterfly if these protected areas include occupied and potential habitat on the hill tops in Cordelia Hills and Potrero Hills. The management of these grasslands according to *CM11 Natural Communities Enhancement and Management* has potential to adversely affect this species. Direct mortality and/or the removal of larval host plants and nectar sources for adults would be an adverse effect under NEPA. Implementation of Mitigation Measure BIO-43, *Avoid and minimize loss of Callippe silverspot butterfly habitat*, would ensure the effect is not adverse.

CEQA Conclusion: If grasslands within the Cordelia Hills and Potrero Hills are protected as part of *CM3 Natural Communities Protection and Restoration* then the subsequent management of these grasslands according to *CM11 Natural Communities Enhancement and Management* has affect this species. Potential impacts from CM11 could include the loss of larval host and nectar sources and direct mortality to larvae and adults resulting from the installation of artificial nesting burrows and structures and the implementation of grassland management techniques, which may include livestock grazing, prescribed burning, and mowing. In addition to these grassland management actions, CM11 also includes guidelines and techniques for invasive plant control, which may include manual control (hand-pulling and digging), mechanical control (large equipment), and chemical control, which could result in direct and indirect effects on larval host plants and nectar plants. These actions could result in adverse effects through habitat modification and a possible reduction in the number of the species or restrict its range and would therefore result in significant impact to the species under CEQA. However, over the term of BDCP callippe silverspot butterfly could benefit from the protection of occupied and potential habitat for the species with the implementation of Mitigation Measure BIO-43, which would avoid and minimize effects from management actions and thus reduce the potential impact to a less-than-significant level.

Mitigation Measures BIO-43: Avoid and minimize loss of Callippe silverspot butterfly habitat

As part of the development of site-specific management plans on protected grasslands in the Cordelia Hills and/or Potrero Hills, the following measures will be implemented to avoid and minimize the loss of callippe silverspot habitat.

- Hilltops in Cordelia Hills and Potrero Hills will be surveyed for callippe silverspot larval host plants (Johnny jump-ups) by a biologist familiar with identifying this plant species. These surveys should occur during the plant's blooming period (typically early January through April)
- If larval host plants are present, then presence/absence surveys for callippe silverspot butterfly larvae will be conducted according to the most recent USFWS approved survey methods by a biologist with previous experience in surveying for and identifying callippe larvae and/or signs of larvae presence. These surveys should be conducted prior to the adult flight season, which usually starts in mid-May.
- If larvae are detected then no further surveys are necessary. If larvae are not detected then surveys for adults will be conducted by a biologist familiar with surveying for and identifying callippe silverspot. Surveys typically start in mid-May and continue weekly for 8 to 10 weeks.
- If callippe silverspot butterflies are detected, then the site-specific management plans will be written to include measures to protect and manage for larval host plants and nectar sources so that they continue to support existing populations and/or allow for future colonization. Mapping of both larval host plants and nectar sources will be incorporated into the management plans.

California Red-Legged Frog

Modeled California red-legged frog habitat in the study area is restricted to freshwater aquatic and grassland habitat, and immediately adjacent cultivated lands along the study area's southwestern edge in CZ 7, CZ 8, CZ 9, and CZ 11. Construction and restoration associated with Alternative 4 conservation measures would result in the temporary and permanent removal of California red-legged frog aquatic and upland (used for cover and dispersal) habitat. Pools in perennial and seasonal streams and stock ponds provide potential aquatic habitat for this species. While stock ponds are underrepresented as a modeled habitat, none is expected to be affected by BDCP actions. Only 1 acre of potential aquatic habitat, which consists primarily of seasonal stream corridors in CZ 8, would be removed. BDCP conservation components would protect and enhance at least 1,000 acres of grassland habitat within CZ 8 (Table 12-4-20).

Factors considered in assessing the value of affected habitat for the California red-legged frog, to the extent that information is available, are presence of limiting habitat (aquatic breeding habitat), known occurrences and clusters of occurrences, proximity of the affected habitat to existing protected lands, and the overall degraded or fragmented nature of the habitat. The study area represents the extreme eastern edge of the species' coastal range, and species' occurrences are reported only from CZ 8 and CZ 11. While conservation measure implementation in other conservation zones would have potential effects on California red-legged frog, those activities near the species occurrences in CZ 8 and CZ 11 are considered to have a proportionately larger effect.

Table 12-4-20. Changes in California Red-Legged Frog Modeled Habitat Associated with Alternative 4 (acres)[a]

Habitat Affected[c]	Conservation Measure[b]	Habitat Type	Permanent		Temporary		Periodic[d]	
			NT	LLT	NT	LLT	Yolo	Floodplain
	CM1	Aquatic	1	1	0	0	NA	NA
		Upland	5	5	153	153	NA	NA
	Total Impacts CM1		**6**	**6**	**153**	**153**		
	CM2–CM18	Aquatic	0	0	0	0	0	0
		Upland	0	0	0	0	0	0
	Total Impacts CM2–CM18		**0**	**0**	**0**	**0**	**0**	**0**
	TOTAL IMPACTS		**6**	**6**	**153**	**153**	**0**	**0**
Habitat Restored/ Created[e]	CM8: Grassland		1,140	2,000	NA	NA	NA	NA
	Total Restoration/Creation		**1,140**	**2,000**				
Habitat Protected[e]	CM3: Grassland		1,000	1,000	NA	NA	NA	NA
	Total Protection		**1,000**	**1,000**				

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late long-term timeframes.

[b] See discussion below for a description of applicable CMs.

[c] LLT acreages are a summation of effects that would occur in the near-term, early long-term and late long-term timeframes. The LLT acreages represent the total amount of habitat that would be affected over the 50-year life of the BDCP and do not reflect habitat increases that would result from restoration, creation and protection activities.

[d] Periodic effects were estimated for the late long-term only. Yolo periodic impacts are presented as a range based on different flow regimes at the proposed notch in Fremont Weir.

[e] Restored/created and protected habitat acreages represent planned conservation activities that would be implemented over the lifetime of the BDCP (see BDCP Chapter 3, *Conservation Strategy*, for specifics).

NT = near-term
LLT = late long-term
NA = not applicable

Impact BIO-44: Loss or conversion of habitat for and direct mortality of California red-legged frog

Alternative 4 conservation measures would result in the permanent and temporary loss combined of up to 1 acre of modeled aquatic habitat and 158 acres of modeled upland habitat for California red-legged frog (Table 12-4-20). The only conservation measure that would result in permanent loss of California red-legged frog habitat would be water conveyance facilities construction. Construction activities associated with the water conveyance facilities, vernal pool complex and grassland restoration, and habitat and management enhancement-related activities, including operation of construction equipment, could result in temporary effects on, as well as injury and mortality of, California red-legged frogs. Timely implementation of the plan's near-term habitat restoration and protection measures and the plan's AMMs would result in no adverse effect under NEPA and no significant impact under CEQA.

- *CM1 Water Facilities and Operation*: Construction of Alternative 4, including transmission line construction, would result in the permanent loss of up to 1 acre of aquatic habitat and 5 acres of upland habitat for California red-legged frog in CZ 8 (Table 12-4-20). Permanent effects would be associated with muck, borrow, and spoils areas, grading, paving, excavating, extension and installation of cross culverts, installation of structural hardscape, and installation and relocation of utilities. Construction-related effects would temporarily disturb 153 acres of upland habitat for the California red-legged frog (Table 12-4-20). Surveys have not found any evidence that the species is using this habitat (Appendix 12C, *2009 to 2011 Bay Delta Conservation Plan EIR/EIS Environmental Data Report*).

  Under the east-west transmission line option there would be no permanent impacts on aquatic habitat and 7 fewer acres of permanent and temporary impacts on upland habitat for California red-legged frog.

- *CM8 Grassland Natural Community Restoration:* Grassland restoration would provide for the restoration of 2,000 acres of grassland within CZ 1, CZ 8, or CZ 11. Restoration of grassland habitat in CZ 8 or potentially CZ 11 is expected to benefit the California red-legged frog by protecting existing upland cover and dispersal habitat from potential loss or degradation that otherwise could occur with future changes in existing land use. Implementation of this measure in some cases would result in the conversion of cultivated land to grassland. To the extent that cultivated land is restored to grassland in CZ 8, this action would remove low-value California red-legged frog dispersal habitat and replace it with high-value grassland foraging and dispersal habitat and, thus, would benefit California red-legged frog. In addition, an unknown number of acres would be temporarily affected during restoration activities which would be offset through AMMs described below.

- *CM9 Vernal Pool and Alkali Seasonal Wetland Complex Restoration*: Some of the acres of vernal pool complex restored under CM9 could be restored in California red-legged frog habitat in CZ 8. To the extent that vernal pool complex is restored in California red-legged frog habitat, it would convert grassland upland and dispersal habitat to vernal pool complex upland and dispersal habitat and, thus, is not expected to affect frog habitat.

- *CM11 Natural Communities Enhancement and Management*: Activities associated with natural communities enhancement and management in protected California red-legged frog habitat, such as ground disturbance or herbicide use to control nonnative vegetation, could result in local adverse habitat effects on, and injury or mortality of, California red-legged frogs. These effects would be avoided and minimized with implementation of the AMMs discussed below. Herbicides would only be used in California red-legged frog habitat in accordance with the written recommendation of a licensed, registered pest control advisor and in conformance with label precautions and federal, state, and local regulations in a manner that avoids or minimizes harm to the California red-legged frog.

Habitat enhancement- and management-related activities in protected California red-legged frog habitats would result in overall improvements to and maintenance of California red-legged frog habitat values over the term of the BDCP. At least 1,000 acres of grassland habitat and some unknown acres of vernal pool complex habitat in CZ 8 are expected to benefit the California red-legged frog through protection of existing upland cover and dispersal habitat from potential loss or degradation that otherwise could happen with future changes in existing land use.

- Critical habitat: Several conservation measures would be implemented in California red-legged frog habitat and designated critical habitat in CZ 8 and CZ 11. Approximately 2,460 acres of designated critical habitat for the California red-legged frog overlaps with the study area along the western edge of CZ 11 in critical habitat unit SOL-1. An additional 862 acres of designated critical habitat is also present along the western edge of CZ 8 in critical habitat unit ALA-2. Conservation actions to protect and enhance grassland habitat for covered species, including California red-legged frog, in CZ 8 could include acquisition and enhancement of designated critical habitat for the California red-legged frog and California tiger salamander. Any habitat enhancement actions for these species in designated critical habitat are expected to enhance the value of any affected designated critical habitat for conservation of California red-legged frog. These actions would result in an overall benefit to California red-legged frog within the study area through protection and management of grasslands with associated intermittent stream habitat and through restoration of vernal pool complex habitat and its associated grassland habitat.
- Operations and maintenance: Ongoing water conveyance facilities operation and maintenance is expected to have little if any adverse effect on the California red-legged frog. Postconstruction operation and maintenance of the above-ground water conveyance facilities could result in ongoing but periodic postconstruction disturbances that could affect California red-legged frog use of the surrounding habitat. Operation of maintenance equipment, including vehicle use along transmission corridors in CZ 8, could also result in injury or mortality of California red-legged frogs if present in work sites. Implementation conservation actions and AMM1–AMM6, AMM10, and AMM14, described below, would reduce these effects.
- Injury and direct mortality: Construction activities associated with the water conveyance facilities, vernal pool complex restoration, and habitat and management enhancement-related activities, including operation of construction equipment, could result in injury or mortality of California red-legged frogs. Breeding, foraging, dispersal, and overwintering behavior may be altered during construction activities, resulting in injury or mortality of California red-legged frog. Frogs occupying burrows could be trapped and crushed during ground-disturbing activities. Degradation and loss of estivation habitat is also anticipated to result from the removal of vegetative cover and collapsing of burrows. Injury or mortality would be avoided and minimized through implementation of seasonal constraints and preconstruction surveys in suitable habitat, collapsing unoccupied burrows, and relocating frogs outside of the construction area as described in AMM1–AMM6, AMM10, and AMM14.

The following paragraphs summarize the combined effects discussed above, describe BDCP conservation actions that would offset or avoid these effects, and provide NEPA and CEQA impact conclusions.

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the effects of construction would not be adverse under NEPA.

Alternative 4 would permanently remove approximately 1 acre of aquatic habitat and 158 acres of upland terrestrial cover habitat for California red-legged frog. The effects would result from construction of the water conveyance facilities (CM1, 159 acres).

Typical NEPA project-level mitigation ratios of 1:1 for restored and protected 1:1 for nontidal wetlands and a ratio of 2:1 for protected grassland habitats would indicate that 1 acre of aquatic habitat should be restored, 1 acre of aquatic habitat should be protected, and 316 acres of grassland should be protected in for California red-legged frog to mitigate for the near-term losses.

The BDCP has committed to near-term restoration of up to 1,140 acres of upland habitat and to protection of at least 1,000 acres of upland habitat. While there is no specific commitment to restore or protect California red-legged frog aquatic habitat, ponds and other aquatic features in the restored grasslands would also be protected to provide aquatic habitat for this species, which would compensate for the loss of 1 acre of aquatic habitat. The landscape-scale goals and objectives would inform the near-term protection and restoration efforts. The natural community restoration and protection activities are expected to be concluded during the first 10 years of plan implementation, which is close enough in time to the occurrence of impacts to constitute adequate mitigation for NEPA purposes. These commitments are more than sufficient to support the conclusion that the near-term effects of Alternative 4 would be not be adverse under NEPA, because the number of acres required to meet the typical ratios described above would be 1 acre of aquatic habitat restored, 1 acre of aquatic habitat protected, and 316 acres of upland communities protected. The plan also contains commitments to implement *AMM1 Worker Awareness Training*, *AMM2 Construction Best Management Practices and Monitoring*, *AMM3 Stormwater Pollution Prevention Plan*, *AMM4 Erosion and Sediment Control Plan*, *AMM5 Spill Prevention, Containment, and Countermeasure Plan*, *AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan*, *AMM10 Restoration of Temporarily Affected Natural Communities*, and *AMM14 California Red-Legged Frog*. These AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas and disposal sites. BDCP Appendix 3.C describes the AMMs in detail.

Late Long-Term Timeframe

Based on the habitat model, the study area supports approximately 149 acres of aquatic and 7,823 acres of upland habitat for California red-legged frog. Alternative 4 as a whole would result in the permanent loss of and temporary effects to 1 acre of aquatic habitat and 158 acres of upland habitat for California red-legged frog for the term of the plan (less than 1% of the total aquatic habitat in the study area and 2% of the total habitat in the study area). The 1 acre of aquatic habitat that would be permanently lost is not known to be used for breeding. Most of the California red-legged frog upland habitat that would be removed consists of naturalized grassland or cultivated land in a highly disturbed or modified setting on lands immediately adjacent to Clifton Court Forebay. The removed upland cover and dispersal habitat is within 0.5 mile of a cluster of known California red-legged frog occurrences to the west. However, this habitat consists mostly of cultivated lands and small patches of grasslands, and past and current surveys in this area have not found any evidence that this habitat is being used (Appendix 12C, *2009 to 2011 Bay Delta Conservation Plan EIR/EIS Environmental Data Report*).

Restoration of up to 2,000 acres of grasslands and protection of at least 1,000 acres of grassland in CZ 8 west of Byron Highway would benefit the California red-legged frog by providing habitat in the portion of the study area with the highest long-term conservation value for the species based on known species occurrences and large, contiguous habitat areas. Ponds and other aquatic features in the grasslands would also be protected to provide aquatic habitat for this species, and the surrounding grassland would provide dispersal and aestivation habitat. Protected lands in CZ 8 would connect with the East Contra Costa County HCP/NCCP reserve system and the extensive Los Vaqueros Watershed lands, including grassland areas supporting this species. This would ensure that the California red-legged frog upland and associated aquatic habitats would be preserved and enhanced in the largest possible patch sizes adjacent to occupied habitat within and adjacent to the study area.

Aquatic features in the protected grasslands in CZ 8 would be maintained and enhanced to provide suitable inundation depth and duration and suitable composition of vegetative cover to support breeding California red-legged frogs (CM11). Additionally, livestock exclusion from streams and ponds and other measures would be implemented as described in CM11 to promote growth of aquatic vegetation with appropriate cover characteristics favorable to California red-legged frogs.

The losses of California red-legged frog aquatic and upland habitat associated with Alternative 4 would represent an adverse effect as a result of habitat modification of a special-status species and potential for direct mortality in the absence of other conservation actions. However, with habitat protection and restoration associated with the conservation components guided by landscape-scale goals and objectives and AMM1–AMM6, AMM10, and AMM14, which would be in place throughout the construction phase, the effects of Alternative 4 on California red-legged frog would not be an adverse effect under NEPA.

CEQA Conclusion:

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the impact of conveyance facilities construction would be less than significant under CEQA. Alternative 4 would permanently remove approximately 1 acre of aquatic habitat and 158 acres of upland terrestrial cover habitat for California red-legged frog. The effects would result from construction of the water conveyance facilities (CM1, 159 acres).

Typical CEQA project-level mitigation ratios of 1:1 for restored and 1:1 protected for nontidal wetlands and a ratio of 2:1 for protected grassland habitats would indicate that 1 acre of aquatic habitat should be protected, 1 acre of aquatic habitat should be protected, and 316 acres of grassland should be protected in for California red-legged frog to mitigate for the near-term losses.

The BDCP has committed to near-term restoration of up to 1,140 acres of upland habitat and to protection of at least 1,000 acres of upland habitat. While there is no specific commitment to restore or protect California red-legged frog aquatic habitat, ponds and other aquatic features in the restored grasslands would also be protected to provide aquatic habitat for this species and compensate for the impact on 1 acre of aquatic habitat. The landscape-scale biological goals and objectives would inform the near-term protection and restoration efforts. The natural community restoration and protection activities are expected to be concluded during the first 10 years of plan implementation, which is close enough in time to the occurrence of impacts to constitute adequate mitigation for CEQA purposes. These commitments are more than sufficient to support the conclusion that the near-term effects of Alternative 4 would be less than significant under CEQA, because the number of acres required to meet the typical ratios described above would be only 1 acre of aquatic habitat restored, 1 acre of aquatic habitat protected, and 316 acres of upland communities protected.

The plan also contains commitments to implement AMM1–AMM6, AMM10, and AMM14, which include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas and disposal sites. BDCP Appendix 3.C describes the AMMs in detail.

Late Long-Term Timeframe

Alternative 4 as a whole would result in the permanent loss of and temporary effects to 1 acre of aquatic habitat and 158 acres of upland habitat for California red-legged frog for the term of the plan (less than 1% of the total aquatic habitat in the study area and 2% of the total habitat in the study area). The 1 acre of aquatic habitat that would be permanently lost is not known to be used for breeding. Most of the California red-legged frog upland habitat that would be removed consists of naturalized grassland or cultivated land in a highly disturbed or modified setting on lands immediately adjacent to Clifton Court Forebay. The removed upland cover and dispersal habitat is within 0.5 mile of a cluster of known California red-legged frog occurrences to the west. However, this habitat consists mostly of cultivated lands and small patches of grasslands, and past and current surveys in this area have not found any evidence that this habitat is being used (Appendix 12C, *2009 to 2011 Bay Delta Conservation Plan EIR/EIS Environmental Data Report*).

Restoration of up to 2,000 acres of grasslands and protection of at least 1,000 acres of grassland in CZ 8 west of Byron Highway would benefit the California red-legged frog by providing habitat in the portion of the study area with the highest long-term conservation value for the species based on known species occurrences and large, contiguous habitat areas. Ponds and other aquatic features in the grasslands would also be protected to provide aquatic habitat for this species, and the surrounding grassland would provide dispersal and aestivation habitat. Protected lands in CZ 8 would connect with the East Contra Costa County HCP/NCCP reserve system and the extensive Los Vaqueros Watershed lands, including grassland areas supporting this species. This would ensure that the California red-legged frog upland and associated aquatic habitats would be preserved and enhanced in the largest possible patch sizes adjacent to occupied habitat within and adjacent to the study area.

Aquatic features in the protected grasslands in CZ 8 would be maintained and enhanced to provide suitable inundation depth and duration and suitable composition of vegetative cover to support breeding California red-legged frogs (CM11). Additionally, livestock exclusion from streams and ponds and other measures would be implemented as described in CM11 to promote growth of aquatic vegetation with appropriate cover characteristics favorable to California red-legged frogs.

The losses of California red-legged frog aquatic and upland habitat associated with Alternative 4 would represent an adverse effect as a result of habitat modification of a special-status species and potential for direct mortality in the absence of other conservation actions. However, with habitat protection and restoration associated with the conservation components guided by landscape-scale goals and objectives and AMMs 1–6, 10, and 14, the effects of Alternative 4 would have a less-than-significant impact on California red-legged frog.

In addition, the plan contains commitments to implement AMM1–AMM6, AMM10, and AMM14. These AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas and disposal sites. BDCP Appendix 3.C describes the AMMs in detail.

Impact BIO-45: Indirect effects of plan implementation on California red-legged frog

Activities associated with conservation component construction and ongoing habitat enhancement, as well as operation and maintenance of above-ground water conveyance facilities, including the transmission facilities, could result in ongoing but periodic postconstruction disturbances with localized effects on California red-legged frog and its habitat, as well as temporary noise and visual disturbances, over the term of the BDCP. Most of the areas indirectly affected are associated with the construction of Byron Forebay and its borrow/spoil areas. No California red-legged frogs were detected during recent surveys conducted in this area (Appendix 12C, *2009 to 2011 Bay Delta Conservation Plan EIR/EIS Environmental Data Report*). These potential adverse effects would be minimized or avoided through AMM1–AMM6, AMM10, and AMM14, which would be in place throughout the plan's construction phase.

Maintenance and refueling of heavy equipment could result in the inadvertent release of sediment and hazardous substances into species habitat. Increased sedimentation could reduce the suitability of California red-legged frog habitat downstream of the construction area by filling in pools and smothering eggs. Accidental spills of toxic fluids also could result in the subsequent loss of California red-legged frog if these materials enter the aquatic system. Hydrocarbon and heavy metal pollutants associated with roadside runoff also have the potential to enter the aquatic system, affecting water quality and California red-legged frog.

Recent discoveries of high mercury levels in frogs (Ugarte et al. 2005, Bank et al. 2007) have elevated concerns about the possible relationship of mercury contamination with frog population declines (Schweiger et al. 2006). Hothem et al. (2010) examined mercury levels in northern Pacific treefrogs, foothill yellow-legged frogs, and American bullfrogs in the Cache Creek watershed contaminated by historical mercury mining. They found mercury levels elevated above EPA criterion for fish in one or more species at 40% of the 35 sites examined. California red-legged frog is a federally listed species in the study area, but it does not occupy the marsh natural communities where methylmercury concerns are greatest. Relative to planned BDCP activities, California red-legged frog exposure to mercury concerns are minimal.

Implementation of the AMMs listed above as part of implementing Alternative 4 would avoid the potential for substantial adverse effects on California red-legged frogs, either indirectly or through habitat modifications. These AMMs would also avoid and minimize effects that could substantially reduce the number of California red-legged frogs, or restrict the species' range. Therefore, the indirect effects of Alternative 4 would not have an adverse effect on California red-legged frog.

CEQA Conclusion: Indirect effects from conservation measure operations and maintenance, as well as construction-related noise and visual disturbances, could impact California red-legged frog in aquatic and upland habitats. The use of mechanical equipment during construction could cause the accidental release of petroleum or other contaminants that could impact California red-legged frog or its prey. The inadvertent discharge of sediment or excessive dust adjacent to California red-legged frog habitat could also have a negative impact on the species or its prey. With implementation of AMM1–AMM6, AMM10, and AMM14, Alternative 4 construction, operation, and maintenance under Alternative 4 would avoid the potential for substantial adverse effects on California red-legged frog, either indirectly or through habitat modifications, and would not result in a substantial reduction in numbers or a restriction in the range of California red-legged frogs. The indirect effects of BDCP Alternative 4 would have a less-than-significant impact on California red-legged frogs.

California Tiger Salamander

Modeled California tiger salamander habitat in the study area contains two habitat types: terrestrial cover and aestivation habitat, and aquatic breeding habitat and is restricted to CZ 1, CZ 2, CZ 4, CZ 5, CZ 7, CZ 8, and CZ 11 (Figure 12-14). Modeled terrestrial cover and aestivation habitat contains all grassland types and alkali seasonal wetland with a minimum patch size of 100 acres and within a geographic area defined by species records and areas most likely to support the species. Modeled aquatic breeding habitat contains vernal pool complex and degraded vernal pool complex.

Alternative 4 is expected to result in the temporary and permanent removal of upland habitat that California tiger salamander uses for cover and dispersal. Potential aquatic habitat for this species would not be affected. While stock ponds are underrepresented as a modeled habitat, none is expected to be affected by BDCP actions. Alternative 4 conservation components would protect at least 8,000 acres of grasslands, 600 acres of vernal pool complex and 150 acres of alkali seasonal wetland complexes in CZ 1, CZ 8, and CZ 11 (Table 12-4-21). Conservation components also would include restoration of 2,000 acres of grassland habitat and an unknown number of acres of vernal pool complex suitable for California tiger salamander.

Factors considered in assessing the value of affected habitat for California tiger salamander, to the extent that information is available, include presence of limiting habitat (aquatic breeding habitat), known occurrences and clusters of occurrences, proximity of the affected habitat to existing protected lands, and the overall degraded or fragmented nature of the habitat. While conservation measures implemented in other CZs could have potential effects on California tiger salamander, those activities in CZ 8 and CZ 11 are considered to have a proportionately larger effect due to their closer proximity to known occurrences of the species. With restoration and protection of habitat, impacts on California tiger salamander would not be adverse for NEPA purposes and would be less than significant under CEQA.

Table 12-4-21. Changes in California Tiger Salamander Modeled Habitat Associated with Alternative 4 (acres)[a]

	Conservation Measure[b]	Habitat Type	Permanent		Temporary		Periodic[d]	
			NT	LLT	NT	LLT	Yolo	Floodplain
Habitat Affected[c]	CM1	Aquatic	0	0	0	0	NA	NA
		Upland	5	5	158	158	NA	NA
	Total Impacts CM1		**5**	**5**	**158**	**158**		
	CM2–CM18	Aquatic	0	0	0	0	0	0

	Upland	280	594	0	0	191–639	0
	Total Impacts CM2–CM18	**280**	**594**	**0**	**0**	**191–639**	**0**
	TOTAL IMPACTS	**285**	**599**	**158**	**158**	**191–639**	**0**
Habitat Restored/ Created[e]	CM8: Grassland	1,140	2,000	NA	NA	NA	NA
	Total Restoration/Creation	**1,140**	**2,000**				
Habitat Protected[e]	CM3: Vernal Pools	400	600	NA	NA	NA	NA
	CM3: Alkali seasonal wetland	120	150				
	CM3: Grassland	2,000	8,000				
	Total Protection	**2,520**	**8,750**				

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late long-term timeframes.

[b] See discussion below for a description of applicable CMs.

[c] LLT acreages are a summation of effects that would occur in the near-term, early long-term and late long-term timeframes. The LLT acreages represent the total amount of habitat that would be affected over the 50-year life of the BDCP and do not reflect habitat increases that would result from restoration, creation and protection activities.

[d] Periodic effects were estimated for the late long-term only. Yolo periodic impacts are presented as a range based on different flow regimes at the proposed notch in Fremont Weir.

[e] Restored/created and protected habitat acreages represent planned conservation activities that would be implemented over the lifetime of the BDCP (see BDCP Chapter 3, *Conservation Strategy*, for specifics).

NT = near-term

LLT = late long-term

NA = not applicable

Impact BIO-46: Loss or conversion of habitat for and direct mortality of California tiger salamander

Alternative 4 conservation measures would result in the permanent and temporary loss combined of up to 757 acres of modeled upland habitat for California tiger salamander (Table 12-4-21). Conservation measures that would result in these losses are conveyance facilities and transmission line construction, and establishment and use of borrow and spoil areas (CM1), Fremont Weir/Yolo Bypass improvements (CM2), tidal habitat restoration (CM4), and construction of a conservation fish hatchery (CM18). Habitat enhancement and management activities (CM11), which include ground disturbance or removal of nonnative vegetation, could result in local adverse habitat effects. In addition, maintenance activities associated with the long-term operation of the water conveyance facilities and other BDCP physical facilities could degrade or eliminate California tiger salamander habitat. Each of these individual activities is described below. A summary statement of the combined impacts and NEPA and CEQA conclusions follows the individual conservation measure discussions.

- *CM1 Water Facilities and Operation*: Construction of Alternative 4 conveyance facilities, including transmission lines, would result in the permanent loss of 5 acres of upland habitat for California tiger salamander habitat, primarily in CZ 8 (Table 12-4-21). Permanent effects would be associated with muck, borrow, and spoils areas, grading, paving, excavating, extension and installation of cross culverts, installation of structural hardscape, and installation and relocation of utilities. Construction-related effects would temporarily disturb 158 acres of upland habitat for the California tiger salamander (Table 12-4-21). There is a high concentration of California tiger salamander occurrences outside the study area immediately to the east of CZ 8, in the

Byron Hills area. The area that would be affected by conveyance facilities construction south of Clifton Court Forebay, where modeled California tiger salamander habitat is of relatively low value in that it consists of fragmented patches of primarily terrestrial habitat surrounded by actively cultivated lands. All recorded CNDDB occurrences of California tiger salamander in CZ 8 are west of the conveyance facilities alignment, and lands to the east consist primarily of actively cultivated lands that are not suitable for the species. Habitat loss in this area is not expected to contribute to habitat fragmentation or impede important California tiger salamander dispersal

The east-west transmission line option would eliminate any permanent impacts on aquatic or upland habitat and reduce temporary impacts on upland habitat by 3 acres.

- *CM2 Yolo Bypass Fisheries Enhancement*: Improvements in the Yolo Bypass would result in the permanent removal of approximately 42 acres of terrestrial cover and aestivation habitat for the California tiger salamander in the late-longterm. The modeled habitat in the Yolo Bypass is of low potential for California tiger salamander: There have been no observations of California tiger salamander in this area based on the results of a number of surveys for vernal pool invertebrates and plants and the bypass lacks vernal pool complexes with large, deep pools or large grassland areas with stock ponds and similar aquatic features that hold water long enough to provide potential breeding habitat for this species.
- *CM4 Tidal Natural Communities Restoration*: This activity would result in the permanent removal of approximately 517 acres of terrestrial cover and aestivation habitat in the study area in the late longterm (Table 12-4-21). Tidal restoration in the Cache Slough area would result in habitat loss along the edges of Lindsey Slough and Duck Slough, and adjacent to cultivated land along the eastern edge of a block of modeled habitat. The modeled aquatic breeding habitat nearby the hypothetical tidal restoration footprint is of relatively high value, consisting of vernal pool complex along Lindsey Slough within the Jepson Prairie area in and near open space. The Jepson Prairie area includes numerous California tiger salamander CNDDB recorded occurrences and overlaps with Critical Habitat Unit 2, Jepson Prairie Unit, for this species. However, the hypothetical tidal restoration footprint does not overlap with critical habitat or recorded occurrences in this area. The tidal restoration at Lindsey Slough would occur along the northeastern edge of the Jepson Prairie block of habitat and would not contribute to fragmentation. Because the estimates of habitat loss resulting from tidal inundation are based on projections of where restoration may occur, actual effects are expected to be lower because of the ability to select sites that minimize effects on California tiger salamander
- *CM11 Natural Communities Enhancement and Management*: Habitat enhancement- and management-related activities in protected California tiger salamander habitats would result in overall improvements to and maintenance of California tiger salamander habitat values over the term of the BDCP. At least 1,000 acres of grassland habitat and some unknown acres of vernal pool complex habitat in CZ 8 are expected to benefit the California tiger salamander through protection of existing upland cover and dispersal habitat from potential loss or degradation that otherwise could happen with future changes in existing land use.

  Activities associated with natural communities enhancement and management over the term of the BDCP in protected California tiger salamander habitat, such as ground disturbance or herbicide use to control nonnative vegetation, could result in local adverse habitat effects and injury or mortality of California tiger salamander and disturbance effects if individuals are present in work sites. Implementation of AMM1–AMM6, AMM10, and AMM13 would reduce these effects. Herbicides would only be used in California tiger salamander habitat in accordance with the written recommendation of a licensed, registered Pest Control Advisor and in conformance with label precautions and federal, state, and local regulations in a manner that avoids or minimizes harm to the California tiger salamander.

- *CM18 Conservation Hatcheries*: This activity could result in the permanent removal of approximately 35 acres of terrestrial cover and aestivation habitat for California tiger salamander in the Yolo Bypass area (CZ 2). The specifications and operations of this facility have not been developed, although the facility is expected to be constructed near Rio Vista on cultivated lands in low-value habitat for the species.
- Critical habitat: Approximately 1,781 acres of designated Critical Habitat Unit 2, Jepson Prairie Unit, for California tiger salamander overlap the study area in CZ 1. While this area is located within the Cache Slough Complex, it is not expected to be affected by BDCP tidal habitat restoration actions. Tidal habitat would be restored approximately 2 miles east of SR 113, with some restoration taking place along the Barker and Lindsey Slough channels west to approximately SR 113 and a small amount (0.4 acre) taking place along the Lindsey Slough Channel west of SR 113 into Critical Habitat Unit 2.
- Operations and maintenance: Ongoing facilities operation and maintenance is expected to have little if any adverse effect on the California tiger salamander. Postconstruction operation and maintenance of the above-ground water conveyance facilities could result in ongoing but periodic disturbances that could affect California tiger salamander use of the surrounding habitat. Operation of maintenance equipment, including vehicle use along transmission corridors in CZ 8, could also result in injury or mortality of California tiger salamanders if present in work sites. These effects, however, would be minimized with implementation of the California tiger salamander measures described in AMM1–AMM6, AMM10, and AMM13.
- Injury and direct mortality: Construction activities associated with the water conveyance facilities, vernal pool complex restoration, and habitat and management enhancement-related activities, including operation of construction equipment, could result in injury or mortality of California tiger salamanders. Foraging, dispersal, and overwintering behavior may be altered during construction activities, resulting in injury or mortality of California tiger salamander if the species is present. Salamanders occupying burrows could be trapped and crushed during ground-disturbing activities. Degradation and loss of estivation habitat is also anticipated to result from the removal of vegetative cover and collapsing of burrows. Injury or mortality would be avoided and minimized through implementation of seasonal constraints and preconstruction surveys in suitable habitat, collapsing unoccupied burrows, and relocating salamanders outside of the construction area as described in AMM1–AMM6, AMM10, and AMM13.

The following paragraphs summarize the combined effects discussed above, describe conservation actions that would offset or avoid these effects, and provide NEPA and CEQA impact conclusions.

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the effects of construction would not be adverse under NEPA.

Alternative 4 would permanently remove approximately 443 acres of upland terrestrial cover habitat for California tiger salamander. There would be no effects on aquatic habitat. The effects would result from construction of the water conveyance facilities (CM1, 163 acres), Yolo Bypass improvements (CM2, 42 acres), tidal habitat restoration (CM4, 203 acres) and construction of conservation hatcheries (CM18, 35 acres).

Typical NEPA project-level mitigation ratios of 2:1 for protected grassland habitats would indicate that 886 acres of grassland should be protected in the near-term for California tiger salamander to mitigate for the near-term losses.

The BDCP has committed to near-term restoration of up to 1,140 acres of upland habitat and to protection of at least 620 acres of aquatic habitat and 2,000 acres of upland habitat. The landscape-scale goals and objectives would inform the near-term protection and restoration efforts. The natural community restoration and protection activities are expected to be concluded during the first 10 years of plan implementation, which is close enough in time to the occurrence of impacts to constitute adequate mitigation for NEPA purposes. These commitments are more than sufficient to support the conclusion that the near-term effects of Alternative 4 would be not be adverse under NEPA, because the number of acres required to meet the typical ratios described above would be only 886 acres of upland communities protected.

In addition, the plan contains commitments to implement *AMM1 Worker Awareness Training*, *AMM2 Construction Best Management Practices and Monitoring*, *AMM3 Stormwater Pollution Prevention Plan*, *AMM4 Erosion and Sediment Control Plan*, *AMM5 Spill Prevention, Containment, and Countermeasure Plan*, *AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan*, *AMM10 Restoration of Temporarily Affected Natural Communities*, and *AMM13 California Tiger Salamander*. These AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas and disposal sites. BDCP Appendix 3.C describes the AMMs in detail.

Late Long-Term Timeframe

Based on the habitat model, the study area supports approximately 7,684 acres of aquatic and 28,334 acres of upland habitat for California tiger salamander. Alternative 4 as a whole would result in the permanent loss of, and temporary effects to, 757 acres of upland habitat for California tiger salamander for the term of the plan (less than 3% of the total upland habitat in the study area). The location of these losses is described above in the discussions of CM1, CM2, CM4, and CM18.

Implementation of BDCP conservation components would result in protection of at least 8,000 acres of grasslands, 600 acres of vernal pool complex and 150 acres of alkali seasonal wetland complex in CZ 1, CZ 8, and CZ 11, and restoration of 2,000 acres of grasslands and an unknown number of acres of vernal pool complex, all of which would benefit California tiger salamander. The protection and restoration would provide habitat in the portions of the study area with the highest long-term conservation value for the species based on known species occurrences and large, contiguous habitat areas. Ponds and other aquatic features in the grasslands would be protected to provide aquatic habitat for this species, and surrounding grassland would provide dispersal and aestivation habitat. Protected grassland and vernal pool complex in CZ 8 would connect with the East Contra Costa County HCP/NCCP reserve system, including grassland areas supporting this species. Protected lands in CZ 11 would connect with the future Solano County reserve system, including grassland and vernal pool complex areas supporting this species. The larger habitat area and improved connectivity would increase opportunities for genetic exchange and allow for colonization of restored habitats in areas where the species has been extirpated. Protecting seasonal ponds associated with grasslands would ensure that California tiger salamander aquatic habitat and associated uplands would be preserved and enhanced in the largest possible patch sizes adjacent to occupied habitat within and adjacent to the study area. Grassland restoration would focus specifically on connecting fragmented patches of protected grasslands, thereby increasing dispersal opportunities for the California tiger salamander. Grasslands would be enhanced to increase burrow availability to provide refugia and cover for aestivating and dispersing California tiger salamanders.

There are three other factors relevant to the effects on California tiger salamander:

- The study area represents a small proportion of the species' geographic range (less than 10%) and known occurrences (less than 0.4%).
- A small proportion (less than 3%) of the modeled habitat in the study area would be affected.
- The highest value habitat that would be potentially affected is in the Cache Slough ROA, where tidal restoration projects would be designed to reduce the loss of California tiger salamander habitat.

The losses of California tiger salamander upland habitat associated with Alternative 4 as a whole would represent an adverse effect as a result of habitat modification of a special-status species and potential for direct mortality in the absence of other conservation actions. However, with habitat protection and restoration associated with the conservation components, guided by landscape-scale goals and objectives and AMM1–AMM6, AMM10, and AMM13, which would be in place throughout the construction phase, the effects of Alternative 4 as a whole on California tiger salamander would not be adverse under NEPA.

CEQA Conclusion:

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the construction impacts would be less than significant under CEQA.

Alternative 4 would permanently remove approximately 443 acres of upland terrestrial cover habitat for California tiger salamander. The effects would result from construction of the water conveyance facilities (CM1, 163 acres), Yolo Bypass improvements (CM2, 42 acres), tidal habitat restoration (CM4, 203 acres) and construction of conservation hatcheries (CM18, 35 acres).

Typical CEQA project-level mitigation ratios of 2:1 for protected grassland habitats would indicate that 886 acres of grassland should be protected in the near-term for California tiger salamander to mitigate for the near-term losses.

The BDCP has committed to near-term restoration of up to 1,140 acres of upland habitat and to protection of at least 620 acres of aquatic habitat and 2,000 acres of upland habitat. The species-specific biological goals and objectives would inform the near-term protection and restoration efforts. The landscape-scale biological goals and objectives would inform the near-term protection and restoration efforts. These commitments are more than sufficient to support the conclusion that the near-term impacts of Alternative 4 would be less than significant under CEQA, because the number of acres required to meet the typical ratios described above would be only 886 acres of upland communities protected.

In addition, the plan contains commitments to implement AMM1–6, AMM10, and AMM13 which include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas and disposal sites. BDCP Appendix 3.C describes the AMMs in detail.

Late Long-Term Timeframe

Based on the habitat model, the study area supports approximately 7,684 acres of aquatic and 28,334 acres of upland habitat for California tiger salamander. Alternative 4 would result in the permanent loss of, or temporary impacts on, 757 acres of upland habitat for California tiger salamander for the term of the plan (less than 3% of the total upland habitat in the study area). The location of these losses is described above in the discussions of CM1, CM2, CM4, and CM18.

Implementation of BDCP conservation components would result in protection of at least 8,000 acres of grasslands, 600 acres of vernal pool complex and 150 acres of alkali seasonal wetland complex in CZ 1, CZ 8, and CZ 11, and restoration of 2,000 acres of grasslands and an unknown number of acres of vernal pool complex, all of which would benefit California tiger salamander. The protection and restoration would provide habitat in the portions of the study area with the highest long-term conservation value for the species based on known species occurrences and large, contiguous habitat areas. Ponds and other aquatic features in the grasslands would be protected to provide aquatic habitat for this species, and surrounding grassland would provide dispersal and aestivation habitat. Protected grassland and vernal pool complex in CZ 8 would connect with the East Contra Costa County HCP/NCCP reserve system, including grassland areas supporting this species. Protected lands in CZ 11 would connect with the future Solano County reserve system, including grassland and vernal pool complex areas supporting this species. The larger habitat area and improved connectivity would increase opportunities for genetic exchange and allow for colonization of restored habitats in areas where the species has been extirpated. Protecting seasonal ponds associated with grasslands would ensure that California tiger salamander aquatic habitat and associated uplands would be preserved and enhanced in the largest possible patch sizes adjacent to occupied habitat within and adjacent to the study area. Grassland restoration would focus specifically on connecting fragmented patches of protected grasslands, thereby increasing dispersal opportunities for the California tiger salamander. Grasslands would be enhanced to increase burrow availability to provide refugia and cover for aestivating and dispersing California tiger salamanders.

There are three other factors relevant to the effects on California tiger salamander.

- The study area represents a small proportion of the species' geographic range (less than 10%) and known occurrences (less than 0.4%).
- A small proportion (less than 3%) of the modeled habitat in the study area would be affected.
- The highest value habitat that would be potentially affected is in the Cache Slough ROA, where tidal restoration projects would be designed to reduce the loss of California tiger salamander habitat.

The losses of California tiger salamander upland habitat associated with Alternative 4 as a whole would represent an adverse effect as a result of habitat modification of a special-status species and potential for direct mortality in the absence of other conservation actions. However, with habitat protection and restoration associated with the conservation components, guided by landscape-scale goals and objectives and AMM1–AMM6, AMM10, and AMM13, which would be in place throughout the construction phase, the impacts of Alternative 4 as a whole on California tiger salamander would not be significant under CEQA.

Impact BIO-47: Indirect effects of plan implementation on California tiger salamander

Activities associated with conservation component construction and ongoing habitat enhancement, as well as operation and maintenance of above-ground water conveyance facilities, including the transmission facilities, could result in ongoing but periodic postconstruction disturbances with localized effects on California tiger salamander and its habitat, and temporary noise and visual disturbances over the term of the BDCP. Most of the areas indirectly affected are associated with the construction of Byron Forebay and its borrow and spoil areas in CZ 8.

Maintenance and refueling of heavy equipment could result in the inadvertent release of sediment and hazardous substances into species habitat. Increased sedimentation could reduce the suitability of California tiger salamander habitat downstream of the construction area by filling in pools and smothering eggs. Accidental spills of toxic fluids into the aquatic system could result in the subsequent loss of California tiger salamander habitat. Hydrocarbon and heavy metal pollutants associated with roadside runoff also have the potential to enter the aquatic system, affecting water quality and California tiger salamander.

Implementation of AMM1–AMM6, AMM10, and AMM13 under Alternative 4 would avoid or minimize the potential for substantial adverse effects on California tiger salamanders, either indirectly or through habitat modifications. These AMMs would also avoid and minimize effects that could substantially reduce the number of California tiger salamanders or restrict the species' range. Therefore, the indirect effects of Alternative 4 would not have an adverse effect on California tiger salamander.

CEQA Conclusion: Indirect effects resulting from conservation measure operations and maintenance as well as construction-related noise and visual disturbances could impact California tiger salamander in aquatic and upland habitats. The use of mechanical equipment during construction could cause the accidental release of petroleum or other contaminants that could impact California tiger salamander or its prey. The inadvertent discharge of sediment or excessive dust adjacent to California tiger salamander habitat could also have a negative impact on the species or its prey. With implementation of AMM1–AMM6, AMM10, and AMM13 as part of Alternative 4, the BDCP would avoid the potential for substantial adverse effects on California tiger salamander, either indirectly or through habitat modifications, and would not result in a substantial reduction in numbers or a restriction in the range of California tiger salamanders. The indirect effects of Alternative 4 would have a less-than-significant impact on California tiger salamander.

Impact BIO-48: Periodic effects of inundation of California tiger salamander habitat as a result of implementation of conservation components

CM2 Yolo Bypass Fisheries Enhancement is the only conservation measure expected to result in periodic inundation of California tiger salamander habitat. Based on the estimated difference in average annual maximum inundation footprint between current and future conditions and the range of 1,000 to 6,000 cfs releases, CM2 would periodically inundate 191 to 639 acres of terrestrial cover and aestivation habitat for the California tiger salamander in CZ 1.

Periodic inundation would not result in a substantial adverse effect on California tiger salamander and its habitat for three reasons.

- The modeled habitat in the Yolo Bypass is of low value for California tiger salamander.

- There have been no California tiger salamander observations in this area based on the results of a number of surveys for vernal pool invertebrates and plants.
- Yolo Bypass lacks vernal pool complexes with large, deep pools or large grassland areas with stock ponds and similar aquatic features that hold water long enough to provide potential breeding habitat for this species.

Therefore, the effects of periodic inundation of California tiger salamander habitat would not have an adverse effect on the species.

CEQA Conclusion: Flooding of the Yolo Bypass from Fremont Weir operations would periodically increase the frequency and duration of inundation of 191–639 acres of terrestrial habitat for California tiger salamander. Because this area is considered low-value habitat and there are no California tiger salamander records in the area, and because of the lack of suitable breeding habitat in this area, the effects of periodic inundation of California tiger salamander habitat would have a less-than-significant impact.

Giant Garter Snake

The habitat model used to assess effects for the giant garter snake is based on aquatic habitat and upland habitat. Modeled aquatic habitat is composed of tidal perennial aquatic (except in Suisun Marsh), tidal freshwater perennial emergent wetland, nontidal freshwater emergent wetland, and nontidal perennial aquatic natural communities; rice fields; and artificial canals and ditches. Modeled upland habitat is composed of all nonwetland and nonaquatic natural communities within 200 feet of modeled aquatic habitat features (primarily grassland and cropland). The modeled upland habitat is ranked as high-, moderate-, or low-value based on giant garter snake associations between vegetation and cover types (U.S. Fish and Wildlife Service 2006b) and historical and recent occurrence records (Hansen pers. comm. In Appendix 12C, *2009 to 2011 Bay Delta Conservation Plan EIR/EIS Environmental Data Report*), and presence of features necessary to fulfill the species' life cycle requirements. Modeled habitat is expressed in acres for aquatic and upland habitats, and in miles for linear movement corridors in aquatic habitat. Other factors considered in assessing the value of affected habitat for the giant garter snake, to the extent that information is available, are proximity to conserved lands and recorded occurrences of the species, proximity to giant garter snake subpopulations (Yolo Basin/Willow Slough and Coldani Marsh/White Slough) in the study area that are identified in the draft recovery plan for this species (U.S. Fish and Wildlife Service 1999), and contribution to connectivity between giant garter snake subpopulations.

Construction and restoration associated with Alternative 4 conservation measures would result in both temporary and permanent losses of giant garter snake modeled habitat as indicated in Table 12-4-22. The majority of the losses would take place over an extended period of time as tidal marsh is restored in the study area. Full implementation of the BDCP would restore or create 25,100 acres of aquatic habitat and 2,000 acres of upland habitat for the giant garter snake, and protect an additional 54,905 acres of upland habitat (including grassland and cultivated lands) for the snake (Table 12-4-22). Approximately 46,905 acres of cultivated lands would be protected and marsh would be restored in and around the two subpopulations to protect and facilitate their expansion. Additional lands would be protected and restored to provide connectivity and facilitate genetic exchange between the two important subpopulations in the study area. As explained below, with the restoration or protection of these amounts of habitat, impacts on the giant garter snake would not be adverse for NEPA purposes and would be less than significant for CEQA purposes.

Table 12-4-22. Changes in Giant Garter Snake Modeled Habitat Associated with Alternative 4[a]

	Conservation Measure[b]	Habitat Type	Permanent		Temporary		Periodic[d]	
			NT	LLT	NT	LLT	Yolo	Floodplain
Habitat Affected[c]	CM1	Aquatic (acres)	49	49	31	31	NA	NA
		Upland[e] (acres)	392	392	177	177	NA	NA
		Aquatic (miles)	15	15	7	7	NA	NA
	Total Impacts CM1 (acres)		**441**	**441**	**208**	**208**		
	CM2–CM18	Aquatic (acres)	161	480	14	37	NA	69
		Upland (acres)	1,113	2,195	154	203	520–1,255	669
		Aquatic (miles)	78	128	0	1	20	NA
	Total Impacts CM2–CM18 (acres)		**1,274**	**2,675**	**168**	**240**	**520–1,255**	**738**
	TOTAL IMPACTS CM1–CM18 (acres)		**1,715**	**3,116**	**376**	**448**	**520–1,255**	**738**
Habitat Restored/ Created[f]	CM4: Tidal restoration		7,700	23,900	NA	NA	NA	NA
	CM10: Nontidal restoration		400	1,200				
	CM8: Grassland		1,140	2,000				
	Total Restoration/Creation		**9,240**	**27,100**				
Habitat Protected[f]	CM3: Cultivated lands		14,900	46,905	NA	NA	NA	NA
	CM3: Grassland		2,000	8,000				
	Total Protection		**16,900**	**54,905**				

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late long-term timeframes.

[b] See discussion below for a description of applicable CMs.

[c] LLT acreages are a summation of effects that would occur in the near-term, early long-term and late long-term timeframes. The LLT acreages represent the total amount of habitat that would be affected over the 50-year life of the BDCP and do not reflect habitat increases that would result from restoration, creation and protection activities.

[d] Periodic effects were estimated for the late long-term only. Yolo periodic impacts are presented as a range based on different flow regimes at the proposed notch in Fremont Weir.

[e] Upland acres represent low-, moderate-, and high-value acreages combined.

[f] Restored/created and protected habitat acreages represent planned conservation activities that would be implemented over the lifetime of the BDCP (see BDCP Chapter 3, *Conservation Strategy*, for specifics).

NT = near-term

LLT = late long-term

NA = not applicable

Impact BIO-49: Loss or conversion of habitat for and direct mortality of giant garter snake

Alternative 4 conservation measures would result in the permanent and temporary loss combined of up to 597 acres of modeled aquatic habitat (tidal and nontidal combined), up to 2,967 acres of modeled upland habitat, and up to 151 miles of channels providing aquatic movement habitat for the giant garter snake (Table 12-4-22). Conservation measures that would result in these losses are conveyance facilities and transmission line construction, and establishment and use of borrow and spoil areas (CM1), Fremont Weir/Yolo Bypass improvements (CM2), tidal habitat restoration (CM4), floodplain restoration (CM5), and construction of a conservation fish hatchery (CM18). Habitat enhancement and management activities (CM11), which include ground disturbance or removal of nonnative vegetation, could result in local adverse habitat effects. In addition, maintenance activities associated with the long-term operation of the water conveyance facilities and other BDCP physical facilities could degrade or eliminate giant garter snake habitat. Each of these individual activities is described below. A summary statement of the combined impacts and NEPA and CEQA conclusions follows the individual conservation measure discussions.

CM1 Water Facilities and Operation: Construction of Alternative 4 conveyance facilities would result in the permanent loss of approximately 441 acres of modeled giant garter snake habitat, composed of 49 acres of aquatic habitat and 392 acres of upland habitat (Table 12-4-22). The 392 acres of upland habitat that would be removed for the construction of the conveyance facilities consists of 50 acres of high-, 293 acres of moderate-, and 49 acres of low-value habitat. In addition, approximately 15 miles of channels providing giant garter snake movement habitat would be removed as a result of conveyance facilities construction. Most of the habitat to be lost is in CZ 6 on Mandeville Island. Refer to the Terrestrial Biology Map Book for a detailed view of Alternative 1A construction locations. Water facilities construction and operation is expected to have low to moderate potential for adverse effects on giant garter snake aquatic habitat on Mandeville Island because it is not located near or between subpopulations identified in the draft recovery plan Development of the water conveyance facilities would also result in the temporary removal of up to 31 acres of giant garter snake aquatic habitat and up to 171 acres of adjacent upland habitat in areas near construction in CZ 5 and CZ 6 (see Table 12-4-22 and Terrestrial Biology Map Book). In addition, approximately 7 miles of channels providing giant garter snake movement habitat would be temporarily removed as a result of conveyance facilities construction.

The east-west transmission line option for Alternative 4 would reduce impacts on giant garter snake aquatic habitat by 8 acres and upland habitat by 35 acres.

- *CM2 Yolo Bypass Fisheries Enhancement*: Construction activity associated with fisheries improvements in the Yolo Bypass would result in the permanent removal of approximately 53 acres of aquatic habitat and 222 acres of upland habitat for the giant garter snake in the late long-term. Most of this habitat removal would occur at the north end of the Yolo Bypass, near Fremont Weir. Construction is expected to have adverse effects on giant garter snake aquatic habitat in the Yolo Bypass area because it is near the Yolo Basin/Willow Slough subpopulation. The upland habitat that would be removed is composed of 86 acres of high-value, 135 acres of moderate-value, and 1 acre of low-value habitat. In addition, approximately 3 miles of channels providing giant garter snake movement habitat would be removed. There would be temporary effects on 14 acres of aquatic habitat and 155 acres of upland habitat associated with improvements in the Yolo Bypass.
- *CM4 Tidal Natural Communities Restoration*: Tidal natural communities restoration would result in the permanent loss of approximately 393 acres of aquatic habitat and 1,848 acres of upland habitat for the giant garter snake to tidal marsh in the late long-term. In addition, approximately 123 miles of channels providing giant garter snake movement habitat would be removed as a result of tidal natural communities restoration. The upland habitat affected by tidal inundation is composed of 300 acres of high-value, 1,289 acres of moderate-value, and 259 acres of low-value habitat. The majority of the effects of tidal natural communities restoration would occur in the Cache Slough and Yolo Bypass areas (CZ 1 and CZ 2). Tidal natural communities restoration is expected to have little to no adverse effects on giant garter snake aquatic habitat in the Cache Slough area because the site is not near or between giant garter snake subpopulations identified in the draft recovery plan. In addition, the area is already tidally influenced, so it has limited value for the giant garter snake because, although giant garter snakes may occur in tidally muted

areas, the species is not likely to use aquatic areas with a strong tidal influence. Similarly, the upland habitat effects in the Cache Slough area are not expected to have an adverse effect on giant garter snake or its habitat.

- *CM5 Seasonally Inundated Floodplain Restoration*: Levee construction associated with floodplain restoration in the south Delta (CZ 7) would result in the permanent removal of approximately 36 acres and temporary removal of 24 acres of aquatic habitat and permanent removal of 68 acres and temporary removal of 48 acres of upland habitat for giant garter snake. Approximately 2 miles of channels providing giant garter snake movement habitat would be removed as a result of floodplain restoration. Seasonally inundated floodplain restoration is expected to have little to no adverse effects on giant garter snake aquatic habitat because the site is not located near or between giant garter snake subpopulations identified in the draft recovery plan. The upland habitat to be removed is composed of 26 acres of moderate-value and 42 acres of low-value upland habitat. As with CM4, the estimates of the effect of seasonal floodplain levee construction and inundation are based on projections of where restoration may occur. Actual effects are expected to be lower because sites would be selected to minimize effects on giant garter snake habitat.
- *CM11 Natural Communities Enhancement and Management*: As described in the BDCP, restoration of up to 25,100 acres of giant garter snake tidal and nontidal aquatic and 2,000 acres of upland habitats and protection and enhancement of at least 54,905 acres of existing giant garter snake upland habitats would benefit the giant garter snake (Table 12-4-22). A variety of habitat management actions included in CM11 that are designed to enhance wildlife values in BDCP-protected habitats may result in localized ground disturbances that could temporarily remove small amounts of giant garter snake habitat. Ground-disturbing activities, such as removal of nonnative vegetation and road and other infrastructure maintenance, are expected to have minor effects on available giant garter snake habitat and are expected to result in overall improvements to and maintenance of giant garter snake habitat values over the term of the BDCP. These effects cannot be quantified, but are expected to be minimal and would be avoided and minimized by the AMMs listed below.
- *CM18 Conservation Hatcheries*: Construction for conservation hatcheries could result in the permanent removal of 35 acres of moderate-value upland habitat for the giant garter snake in the Yolo Bypass area (CZ 2). The specifications and operations of this facility have not been developed, nor has the facility location been specifically determined, although it is expected to be located within the study area in the vicinity of Rio Vista.
- Operations and maintenance: Postconstruction operation and maintenance of the above-ground water conveyance facilities and restoration infrastructure could result in ongoing but periodic disturbances that could affect giant garter snake use of the surrounding habitat in the Yolo Bypass, the Cache Slough area, and the north and south Delta (CZ 1, CZ 2, CZ 4, CZ 5, CZ 6, CZ 7, and CZ 8). Maintenance activities would include vegetation management, levee and structure repair, and regrading of roads and permanent work areas. These effects, however, would be reduced by AMMs and conservation actions as described below.
- Injury and direct mortality: Construction vehicle activity may cause injury or mortality of the giant garter snake. If snakes reside where activities take place (most likely in the vicinity of the two subpopulations: Yolo Basin/Willow Slough [CZ 2] and the Coldani Marsh/White Slough [CZ 4]), the operation of equipment for land clearing, construction, conveyance facilities operation and maintenance, and habitat restoration, enhancement, and management could result in injury

or mortality of giant garter snakes. This risk is highest from late fall through early spring, when the snakes are dormant. Increased vehicular traffic associated with BDCP actions could contribute to a higher incidence of road kill. However, conducting construction during the active period when feasible (reducing the risk of crushing snakes in burrows during their inactive period), dewatering aquatic areas prior to construction, construction monitoring, and other measures would be implemented to avoid and minimize injury or mortality of this species during construction, as required by AMMs listed below.

The following paragraphs summarize the combined effects discussed above and describe other BDCP conservation actions identified for both the near-term and late-longterm timeframes, that offset or avoid these effects. NEPA and CEQA impact conclusions are also included.

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the effects of construction would not be adverse under NEPA.

Alternative 4 would remove 255 acres of aquatic habitat and 1,836 acres of upland habitat for giant garter snake in the study area during the near-term. These effects would result from the construction of the water conveyance facilities (CM1, 80 acres of aquatic and 569 acres of upland habitat), and from implementing tidal restoration (CM4, 109 acres of aquatic and 835 acres of upland habitat), Yolo Bypass fisheries improvements (CM2, 67 acres of aquatic and 377 acres of upland habitat), and Conservation Hatcheries (CM18, 35 acres of upland habitat). The aquatic habitat losses would occur in tidal and nontidal wetland natural communities and rice fields. The upland habitat losses would occur in cropland and grassland communities. The east-west transmission line option for Alternative 4 would reduce aquatic impacts by 8 acres and upland impacts by 35 acres for giant garter snake.

Typical NEPA project-level mitigation ratios for aquatic habitats (1:1 for restoration) and for upland habitats (2:1 for protection) for affected natural communities would indicate that 255 acres of aquatic communities should be restored and 3,672 acres of upland habitats should be protected to mitigate for near-term habitat losses.

The BDCP has committed to near-term restoration of up to 8,100 acres of aquatic habitat and up to 1,140 acres of upland habitat, and to protection of at least 16,900 acres of upland habitat. The species-specific biological goals and objectives would inform the near-term protection and restoration efforts. The natural community restoration and protection activities are expected to be concluded during the first 10 years of plan implementation, which is close enough in time to the occurrence of impacts to constitute adequate mitigation for NEPA purposes. These commitments are more than sufficient to support the conclusion that the near-term effects of Alternative 4 would be not be adverse under NEPA, because the number of acres required to meet the typical ratios described above would be only 255 acres of aquatic communities restored and 3,672 acres of upland communities protected.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training, AMM2 Construction Best Management Practices and Monitoring, AMM3 Stormwater Pollution Prevention Plan, AMM4 Erosion and Sediment Control Plan, AMM5 Spill Prevention, Containment, and Countermeasure Plan, AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan, AMM7 Barge*

Operations Plan, AMM10 Restoration of Temporarily Affected Natural Communities, and AMM16 Giant Garter Snake. All of these AMMs include elements that avoid or minimize the risk of BDCP activities affecting habitats and species adjacent to work areas and disposal sites. The AMMs are described in detail in BDCP Appendix 3.C.

Late Long-Term Timeframe

Based on modeled habitat, the study area supports approximately 33,963 acres of aquatic and 58,717 acres of upland habitat for giant garter snake. Alternative 4 as a whole would result in the permanent loss of and temporary effects to 597 acres of aquatic habitat and to 2,967 acres of upland habitat for giant garter snake during the term of the plan (2% of the total aquatic habitat in the study area and 5% of the total upland habitat in the study area). The locations of these losses are described above in the analyses of individual conservation measures.

The BDCP has committed to protecting 8,000 acres of grassland and 46,905 acres of cultivated lands in the study area, and restoring 25,100 acres tidal and nontidal wetlands and 2,000 acres of grasslands in the study area. To ensure that these natural community conservation benefits giant garter snake, the plan's biological goals and objectives for giant garter snake habitat further specify that at least 1,200 acres of nontidal marsh would be restored with suitable habitat characteristics for giant garter snake. This would include two 600-acre blocks of nontidal marsh restoration, one of which would be located within the Coldani Marsh/Willow Slough giant garter snake subpopulation in CZ 4 and/or 5, and the second of which would be located in or near the Yolo Basin/White Slough giant garter snake population CZ 2. At least 200 acres of grassland would be protected or restored adjacent to each 600-acre block. Additionally, at least 1,500 acres of rice land or equivalent value habitat (e.g., perennial aquatic habitat) would be restored or protected to create connections from the Coldani Marsh/White Slough population to other areas in the giant garter snake historic range (CM3, CM4, CM10). Lands to be protected and restored specifically for giant garter snake total at least 3,100 acres (at least 1,200 acres nontidal marsh, 400 acres of grassland, and 1,500 acres of rice or equivalent value habitat).

Protection and management of cultivated lands (CM3 and CM11) through the BDCP would also benefit the giant garter snake by providing connectivity and maintaining irrigation and drainage channels that provide aquatic habitat for the snake. Protection of cultivated land would be prioritized in areas that provide connectivity between other protected lands. Small patches of important wildlife habitat associated with cultivated lands, such as drainages, grasslands, ponds, and wetlands, would be protected. BDCP conservation of cultivated lands would help to maintain in the landscape a matrix of suitable interconnected canals with reliable water, associated emergent vegetation, and adjacent upland habitats essential for conservation of this species. Approximately 9.8% of the cultivated lands in the Plan Area currently support modeled giant garter snake upland habitat. Assuming a similar proportion on protected cultivated lands, an estimated 1,966 acres of giant garter snake upland habitat would be protected on cultivated lands (20,000 acres X 0.098). Assuming the length of canals and ditches providing giant garter snake movement habitat on the protected cultivated lands is proportional to the length currently present on cultivated lands in the Plan Area, the 45,405 acres of protected cultivated lands would support approximately 159 miles of movement habitat for the giant garter snake (1,777 miles X [45,405 acres protected/506,627 acres in Plan Area])

The natural communities associated with these protection and restoration actions are included in Table 12-4-22. Habitat would be restored in CZs 1, 2, 4, 5, 6, and 7.

The are four other factors relevant to effects on giant garter snake:

- The giant garter snake habitat to be lost is small relative to habitat availability in the study area and would occur in multiple, widely separate areas, thereby not affecting one area disproportionately.
- Most of the affected habitat is in areas where the giant garter snake is not expected to occur.
- Approximately 393 acres of aquatic habitat and 1,848 acres of upland habitat would be converted to tidal marsh, a portion of which is expected to have muted tidal influence and therefore provide suitable aquatic habitat for the species.
- Temporarily disturbed areas would be restored as giant garter snake habitat within 1 year following completion of construction and management activities. Under AMM10, a restoration and monitoring plan would be developed prior to initiating any construction-related activities associated with the conservation measures or other covered activities that would result in temporary effects on natural communities.

The losses of giant garter snake aquatic and upland habitat associated with Alternative 4 as a whole would represent an adverse effect as a result of habitat modification of a special-status species and potential for direct mortality in the absence of other conservation actions. However, with habitat protection and restoration associated with CM4, CM8, and CM10, guided by species-specific goals and objectives and AMM1–AMM7, AMM10, and AMM16, which would be in place throughout the construction phase, the effects of Alternative 4 as a whole on giant garter snake would not be adverse under NEPA.

CEQA Conclusion:

Near-Term Timeframe

Because the water conveyance facilities construction (CM1) is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the effects of construction would be less than significant under CEQA.

Alternative 4 would remove 255 acres of aquatic habitat and 1,836 acres of upland habitat for giant garter snake in the study area during the near-term. These effects would result from the construction of the water conveyance facilities (CM1, 80 acres of aquatic and 569 acres of upland habitat), and from implementing tidal restoration (CM4, 109 acres of aquatic and 835 acres of upland habitat), Yolo Bypass fisheries improvements (CM2, 67 acres of aquatic and 377 acres of upland habitat), and Conservation Hatcheries (CM18, 35 acres of upland habitat). The aquatic habitat losses would occur in tidal and nontidal wetland natural communities and rice fields. The upland habitat losses would occur in cropland and grassland communities. The east-west transmission line option for Alternative 4 would reduce aquatic impacts by 8 acres and upland impacts by 35 acres for giant garter snake.

Typical CEQA project-level mitigation ratios for aquatic habitats (1:1 for restoration) and for upland habitats (2:1 for protection) for affected natural communities would indicate that 255 acres of aquatic communities should be restored and 3,672 acres of upland habitats should be protected to mitigate for near-term habitat losses.

The BDCP has committed to near-term restoration of up to 8,100 acres of aquatic habitat and up to 1,140 acres of upland habitat, and to protection of at least 16,900 acres of upland habitat. These habitat protection and restoration measures would benefit the giant garter snake and the plan's species-specific biological goals and objectives would inform the near-term protection and restoration efforts. The natural community restoration and protection activities are expected to be concluded during the first 10 years of plan implementation, which is close enough in time to the occurrence of impacts to constitute adequate mitigation for CEQA purposes. These commitments are more than sufficient to support the conclusion that the near-term impacts of Alternative 4 would be less than significant under CEQA, because the number of acres required to meet the typical ratios described above would be only 255 acres of aquatic communities restored and 3,672 acres of upland communities protected.

The Plan also includes commitments to implement AMM1–AMM7, AMM10, and AMM16. All of these AMMs include elements that avoid or minimize the risk of BDCP activities affecting habitats and species adjacent to work areas and disposal sites. The AMMs are described in detail in BDCP Appendix 3.C.

Late Long-Term Timeframe

Based on modeled habitat, the study area supports approximately 33,963 acres of aquatic and 58,717 acres of upland habitat for giant garter snake. Alternative 4 as a whole would result in the permanent loss of and temporary effects to 597 acres of aquatic habitat and to 2,967 acres of upland habitat for giant garter snake during the term of the plan (2% of the total aquatic habitat in the study area and 5% of the total upland habitat in the study area). The locations of these losses are described above in the analyses of individual conservation measures.

The BDCP has committed to protecting 8,000 acres of grassland and 46,905 acres of cultivated lands in the study area, and restoring 25,100 acres tidal and nontidal wetlands and 2,000 acres of grasslands in the study area. To ensure that these natural community conservation benefits giant garter snake, the plan's biological goals and objectives for giant garter snake habitat further specify that at least 1,200 acres of nontidal marsh would be restored with suitable habitat characteristics for giant garter snake. This would include two 600-acre blocks of nontidal marsh restoration, one of which would be located within the Coldani Marsh/Willow Slough giant garter snake subpopulation in CZ 4 and/or 5, and the second of which would be located in or near the Yolo Basin/White Slough giant garter snake population CZ 2. At least 200 acres of grassland would be protected or restored adjacent to each 600-acre block. Additionally, at least 1,500 acres of rice land or equivalent value habitat (e.g., perennial aquatic habitat) would be restored or protected to create connections from the Coldani Marsh/White Slough population to other areas in the giant garter snake historic range (CM3, CM4, CM10). Lands to be protected and restored specifically for giant garter snake total at least 3,100 acres (at least 1,200 acres nontidal marsh, 400 acres of grassland, and 1,500 acres of rice or equivalent value habitat).

Protection and management of cultivated lands (CM3 and CM11) through the BDCP would also benefit the giant garter snake by providing connectivity and maintaining irrigation and drainage channels that provide aquatic habitat for the snake. Protection of cultivated land would be prioritized in areas that provide connectivity between other protected lands. Small patches of important wildlife habitat associated with cultivated lands, such as drainages, grasslands, ponds, and wetlands, would be protected. BDCP conservation of cultivated lands would help to maintain in the landscape a matrix of suitable interconnected canals with reliable water, associated emergent vegetation, and adjacent upland habitats essential for conservation of this species. Approximately 9.8% of the cultivated lands in the Plan Area currently support modeled giant garter snake upland habitat. Assuming a similar proportion on protected cultivated lands, an estimated 1,966 acres of giant garter snake upland habitat would be protected on cultivated lands (20,000 acres X 0.098). Assuming the length of canals and ditches providing giant garter snake movement habitat on the protected cultivated lands is proportional to the length currently present on cultivated lands in the Plan Area, the 45,405 acres of protected cultivated lands would support approximately 159 miles of movement habitat for the giant garter snake (1,777 miles X [45,405 acres protected/506,627 acres in Plan Area])

The natural communities associated with these protection and restoration actions are included in Table 12-4-22. Habitat would be restored in CZs 1, 2, 4, 5, 6, and 7.

The four other factors relevant to effects on giant garter snake:

- The giant garter snake habitat to be lost is small relative to habitat availability in the study area and would occur in multiple, widely separate areas, thereby not affecting one area disproportionately.
- Most of the affected habitat is in areas where the giant garter snake is not expected to occur.
- Approximately 393 acres of aquatic habitat and 1,848 acres of upland habitat would be converted to tidal marsh, a portion of which is expected to have muted tidal influence and therefore provide suitable aquatic habitat for the species.
- Temporarily disturbed areas would be restored as giant garter snake habitat within 1 year following completion of construction and management activities. Under AMM10, a restoration and monitoring plan would be developed prior to initiating any construction-related activities associated with the conservation measures or other covered activities that would result in temporary effects on natural communities.

The BDCP also includes a number of AMMs (AMM1–AMM7, AMM10, and AMM16) directed at minimizing or avoiding potential impacts on adjacent habitats during construction and operation of the conservation measures. Considering the protection and restoration provisions, which would provide acreages of new or enhanced habitat in amounts greater than necessary to compensate for habitats lost to construction and restoration activities, implementation of Alternative 4 as a whole would not result in a substantial adverse effect through habitat modifications and would not substantially reduce the number or restrict the range of the species. Therefore, the loss of giant garter snake habitat and potential mortality of snakes would have a less-than-significant impact on giant garter snake under CEQA.

Impact BIO-50: Indirect effects of plan implementation on giant garter snake

Construction activities associated with water conveyance facilities, conservation components and ongoing habitat enhancement, as well as operation and maintenance of above-ground water conveyance facilities, including the transmission facilities, could result in ongoing periodic postconstruction disturbances with localized effects on giant garter snake habitat, and temporary noise and visual disturbances over the term of the BDCP. These potential adverse effects would be minimized or avoided through AMM1–AMM7, AMM10, and AMM16, which would be in effect throughout the plan's construction phase.

The use of mechanical equipment during water conveyance facilities construction could cause the accidental release of petroleum or other contaminants that could affect giant garter snake or its aquatic prey. The inadvertent discharge of sediment or excessive dust adjacent to giant garter snake habitat could also have a negative effect on the species or its prey. AMM1–AMM6 would minimize the likelihood of such spills occurring and would ensure measures are in place to prevent runoff from the construction area and potential adverse effects of sediment or dust on giant garter snake or its prey.

Covered activities have the potential to exacerbate bioaccumulation of mercury in covered species that feed on aquatic species, including giant garter snake. The operational impacts of new flows under CM1 were analyzed to assess potential effects on mercury concentration and bioavailability. Results indicated that changes in total mercury levels in water and fish tissues due to future operational conditions were insignificant (see BDCP Appendix 5.D, Tables 5D.4-3, 5D.4-4, and 5D.4-5).

Marsh (tidal and nontidal) and floodplain restoration also have the potential to increase exposure to methylmercury. Mercury is transformed into the more bioavailable form of methylmercury in aquatic systems, especially areas subjected to regular wetting and drying such as tidal marshes and floodplains. Thus, BDCP restoration activities that create newly inundated areas could increase bioavailability of mercury. Increased methylmercury associated with natural community and floodplain restoration may indirectly affect giant garter snake, which feeds on small fishes, tadpoles, and small frogs, especially introduced species, such as small bullfrogs (*Rana catesbeiana*) and their larvae, carp (*Cyprinus carpio*), and mosquitofish (*Gambusia affinis*). In general, the highest methylation rates are associated with high tidal marshes that experience intermittent wetting and drying and associated anoxic conditions (Alpers et al. 2008).

Mercury concentrations in giant garter snake have been studied in the Central Valley of California, where snakes were found to be chronically exposed to mercury (liver–0.393 μg/g) but at "lower concentrations of total Hg in livers compared to snakes from most other geographic areas" (Wylie et al. 2009). Extant populations of giant garter snake within the Plan Area are known only from the upper Yolo Basin and at the Coldani Marsh/White Slough area. Davis et al. (2007) found mercury concentrations in fish at White Slough (and the Central Delta in general) to be relatively low compared to other areas of the Delta. No restoration activities involving flooding (and subsequent methylation of mercury) are planned within the known range of the Coldani Marsh/White Slough giant garter snake population. Effects on giant garter snake from increased methylmercury exposures is more likely in the Yolo Basin, where some of the highest concentrations of mercury and methylmercury have been documented (Foe et al. 2008). Impacts from exposure to methylmercury may include decreased predator avoidance, reduced success in prey capture, difficulty in shedding, and reduced ability to move between shelter and foraging or thermoregulation areas (Wylie et al. 2009). In general, giant garter snakes within the Plan Area are currently exposed to methylmercury concentrations that are considered harmful, but the effect that current body burdens have on individuals or populations is unknown, limiting the ability to deduce the effects of an increase in methylmercury exposure. Planned floodplain restoration activities in the Yolo Basin are expected to seasonally increase methylmercury production, but the periods of production and increased exposure to methylmercury do not overlap with giant garter snake seasonal activity periods. This seasonal trend should help to decrease risk to the giant garter snake, although snakes could prey on individuals that have been exposed to methylmercury during the previous season.

The potential mobilization or creation of methylmercury within the Plan Area varies with site-specific conditions and would need to be assessed at the project level. Measures described in *CM12 Methylmercury Management* include provisions for project-specific Mercury Management Plans. Along with minimization and mitigation measures and adaptive management and monitoring, CM12 is expected to reduce the effects of methylmercury resulting from BDCP natural communities and floodplain restoration on giant garter snake.

Implementation of the AMMs listed above as part of implementing Alternative 4 would avoid the potential for substantial adverse effects on giant garter snakes, either indirectly or through habitat modifications. These AMMs would also avoid and minimize effects that could substantially reduce the number of giant garter snakes or restrict the species' range. Therefore, the indirect effects of Alternative 4 would not have an adverse effect on giant garter snake.

CEQA Conclusion: Indirect effects from conservation measure operations and maintenance as well as construction-related noise and visual disturbances could impact giant garter snake in aquatic and upland habitats. The use of mechanical equipment during construction could cause the accidental release of petroleum or other contaminants that could impact giant garter snake or its prey. The inadvertent discharge of sediment or excessive dust adjacent to giant garter snake habitat could also have a negative impact on the species or its prey. With implementation of AMM1–AMM7, AMM10, and AMM16 as part of Alternative 4 construction, operation and maintenance, the BDCP would avoid the potential for substantial adverse effects on giant garter snakes, either indirectly or through habitat modifications. Alternative 4 would not result in a substantial reduction in numbers or a restriction in the range of giant garter snakes. Therefore, the indirect effects of BDCP Alternative 4 would have a less-than-significant impact on giant garter snakes.

Giant garter snake could experience indirect effects from increased exposure to methylmercury as a result of tidal habitat restoration (CM4). With implementation of CM12, the potential indirect effects of methlymercury would not result in a substantial reduction in numbers or a restriction in the range of giant garter snakes, and, therefore, would have a less-than-significant impact on giant garter snakes.

Impact BIO-51: Periodic effects of inundation of giant garter snake habitat as a result of implementation of conservation components

CM2 Yolo Bypass Fisheries Enhancement: The proposed changes in Fremont Weir operations would occur intermittently from as early as mid-November through as late as mid-May. The core operations would occur during the winter/spring period, which corresponds mostly with the giant garter snake's inactive season. During this time, snakes are overwintering underground. Giant garter snakes that occur in the bypass during the active season could potentially overwinter in the bypass during the inactive season: these snakes may be vulnerable to inundation of the bypass and could be drowned or displaced from overwintering sites. However, most typically, Fremont Weir "notch" operations would occur on the shoulders of time periods in which the Sacramento River rises enough for Fremont Weir to overtop passively, without the proposed project. Project-associated inundation of areas that would not otherwise have been inundated is expected to occur in no more than 30% of all years, since Fremont Weir is expected to overtop the remaining estimated 70% of all years, and during those years notch operations would not typically affect the maximum extent of inundation that would have occurred under existing conditions. In more than half of all years under existing conditions, an area greater than the project-related inundation area already inundates during the snake's inactive season.

Flooding of the Yolo Bypass from *CM2 Yolo Bypass Fisheries Enhancement* would periodically affect 520–1,255 acres of upland habitat for giant garter snake (Table 12-4-22). The inundation could affect overwintering snakes in 204 to 631 acres of high-value upland habitat, 2 to 17 acres of moderate-value upland habitat, and 261 to 613 acres of low-value upland habitat. The majority of occurrences of giant garter snakes associated with the Yolo Basin/Willow Slough subpopulation has been reported from outside of the Yolo Bypass. While there have been reported occurrences within the interior of the Yolo Bypass, most of these occurrences are from the western side of the bypass (Hansen 2005, 2006, 2007, and 2009). However, the giant garter snake upland habitat that would be inundated as a result of CM2 in no more than 30% of years is located in the central and eastern portions of the bypass. This area already inundates in more than 50% of years, so the species is not expected to overwinter in this area. Therefore, increased inundation in the Yolo Bypass as a result of BDCP is expected to have a minimal effect on the Yolo Basin/Willow Slough subpopulation.

CM5 Seasonally Inundated Floodplain Restoration would periodically inundate 69 acres of aquatic habitat and 669 acres of upland habitat for the giant garter snake in the south Delta (CZ 7). The aquatic habitat to be inundated is of low value because it is not located in the vicinity of existing conserved lands, is not in the vicinity of any giant garter snake occurrences, and is not located near or between subpopulations identified in the recovery plan (U.S. Fish and Wildlife Service 1999). The upland habitat to be inundated contains 432 acres of moderate-value and 237 acres of low-value habitat.

Based on modeled habitat for the giant garter snake, the study area supports approximately 33,963 acres of aquatic and 58,717 acres of upland habitat for giant garter snake. Approximately 69 acres of aquatic habitat (less than 1% of the total in the study area) and up to 1,924 acres of giant garter snake upland habitat (3% of total in the study area) may be adversely affected by periodic flooding as a consequence of floodplain restoration and the operation of the Fremont Weir.

Periodic effects on aquatic and upland habitat for giant garter snake associated with implementing Alternative 4 are not expected to result in substantial adverse effects on giant garter snakes, either directly or through habitat modifications, as it would not result in a substantial reduction in numbers or a restriction in the range of giant garter snakes. Therefore, Alternative 4 would not adversely affect the species.

CEQA Conclusion: Flooding of the Yolo Bypass from CM2 and creation of seasonally inundated floodplain in various parts of the study area (CM5) would periodically affect a total of 69 acres of aquatic habitat and up to 1,924 acres of upland habitat for giant garter snake. The inundation could affect overwintering snakes. The majority of occurrences of giant garter snakes associated with the Yolo Basin/Willow Slough subpopulation have been reported from outside of the Yolo Bypass. While there have been reported occurrences within the interior of the Yolo Bypass, most of these occurrences are from the western side of the bypass (Hansen 2005, 2006, 2007, and 2009). However, the giant garter snake upland habitat that would be inundated as a result of CM2 in no more than 30% of years is located in the central and eastern portions of the bypass. This area already inundates in more than 50% of years, so the species is not expected to overwinter in this area. Therefore, increased inundation in the Yolo Bypass as a result of BDCP is expected to have a minimal effect on the Yolo Basin/Willow Slough subpopulation. Therefore, implementing Alternative 4, including AMM1–AMM7, AMM10, and AMM16, would not be expected to result in substantial adverse effects on giant garter snakes, either directly or through habitat modifications, because it would not result in a substantial reduction in numbers or a restriction in the range of giant garter snakes. Periodic effects of inundation under Alternative 4 would have a less-than-significant impact on the species.

Western Pond Turtle

The habitat model used to assess effects on the western pond turtle is based on aquatic and upland nesting and overwintering habitat. The model quantified two types of upland nesting and overwintering habitat, including upland habitat in natural communities as well as upland in agricultural areas adjacent to aquatic habitats. Both of these upland habitat types are combined for this analysis. Factors considered in assessing the value of affected aquatic habitat are natural community type and availability of adjacent nesting and overwintering habitat. The highest value aquatic habitat types in the study area consist of nontidal freshwater perennial emergent wetlands and ponds adjacent to suitable nesting and overwintering habitat (Patterson pers. comm.). Less detail is provided on effects on dispersal habitat because, although dispersal habitat is important for maintaining and increasing distribution and genetic diversity, turtles have been known to travel over many different land cover types; therefore, this habitat type is not considered limiting. The value of dispersal habitat depends less on the habitat type itself than on the proximity of that habitat type to high-value aquatic and nesting and overwintering habitat.

Construction and restoration associated with Alternative 4 conservation measures would result in both temporary and permanent losses of western pond turtle modeled habitat, as indicated in Table 12-4-23. The majority of these losses would take place over an extended period of time as tidal marsh is restored in the study area. Full implementation of Alternative 4 would restore or create 25,100 acres of aquatic habitat and 2,000 acres of upland habitat for western pond turtle, and protect an additional 54,405 acres of upland habitat (including grassland and cultivated lands) for the turtle(Table 12-4-23). The conservation approach for western pond turtle involves restoration and protection of aquatic and adjacent upland habitat, and establishment of an interconnected reserve system that provides for western pond turtle dispersal. The habitat protection and restoration needs for this species are addressed at the landscape and natural community levels. The conservation measures that would be implemented to achieve the goals and objectives are described below. With restoration and protection of habitat as planned in the BDCP, impacts on western pond turtle would not be adverse for NEPA purposes and would be less than significant under CEQA.

Table 12-4-23. Changes in Western Pond Turtle Modeled Habitat Associated with Alternative 4[a]

Habitat Affected[c]	Conservation Measure[b]	Habitat Type	Permanent		Temporary		Periodic[d]	
			NT	LLT	NT	LLT	Yolo	Floodplain
	CM1	Aquatic (acres)	49	49	79	79	NA	NA
		Upland[e] (acres)	161	161	58	58	NA	NA
	Total Impacts CM1 (acres)		**210**	**210**	**137**	**137**		
	CM2–CM18	Aquatic (acres)	93	125	22	43	94–154	75
		Upland (acres)	459	1,100	45	61	228–523	404
	Total Impacts CM2–CM18 (acres)		**552**	**1,225**	**67**	**104**	**322–677**	**479**
	TOTAL IMPACTS CM1–CM18 (acres)		**762**	**1,435**	**204**	**241**		**479**
Habitat Restored/ Created[f]	CM4: Tidal restoration		7,700	23,900	NA	NA	NA	NA
	CM10: Nontidal restoration		400	1,200				
	CM8: Grassland		1,140	2,000				
	Total Restoration/Creation		**9,240**	**27,100**				

Habitat Protected[f] CM3: Cultivated lands	14,900	45,405		NA	NA
	CM3: Grassland	2,000	8,000		
	Total Protection (acres)	**16,900**	**53,405**		

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late long-term timeframes.

[b] See discussion below for a description of applicable CMs.

[c] LLT acreages are cumulative and include NT acreages.

[d] Periodic effects were estimated for the late long-term only. Yolo periodic impacts are presented as a range based on different flow regimes at the proposed notch in Fremont Weir.

[e] Upland acres represent upland nesting and overwintering habitat acreages combined for both natural communities and agricultural lands adjacent to aquatic habitats.

[f] Restored/created and protected habitat acreages represent planned conservation activities that would be implemented over the lifetime of the BDCP (see BDCP Chapter 3, *Conservation Strategy*, for specifics).

[g] Western pond turtle use of protected lands would be based on movement distances from aquatic habitat so that not all of these acres would be utilized.

NT = near-term

LLT = late long-term

NA = not applicable

Impact BIO-52: Loss or conversion of habitat for and direct mortality of western pond turtle

Alternative 4 conservation measures would result in the permanent loss or conversion of up to 296 acres of aquatic habitat and 1,380 acres of upland nesting and overwintering habitat (Table 12-4-23). Activities that would result in the temporary and permanent loss of western pond turtle modeled habitat are conveyance facilities and transmission line construction, and establishment and use of borrow and spoil areas (CM1), Yolo Bypass improvements (CM2), tidal habitat restoration (CM4) and floodplain restoration (CM5). Habitat enhancement and management activities (CM11), such as ground disturbance or removal of nonnative vegetation, could result in local adverse habitat effects. In addition, maintenance activities associated with the long-term operation of the water conveyance facilities and other BDCP physical facilities could degrade or eliminate western pond turtle habitat. The activity accounting for most (80%) of the habitat loss or conversion would be *CM4 Tidal Natural Communities Restoration*. Each activity is described below. A summary statement of the combined effects and NEPA and CEQA conclusions follow the individual conservation measure discussions.

- *CM1 Water Facilities and Operation*: Construction of Alternative 4 conveyance facilities would result in the permanent loss of approximately 49 acres of aquatic habitat and 161 acres of upland nesting and overwintering habitat for the western pond turtle in the study area (Table 12-4-23). Development of the water conveyance facilities would also result in the temporary removal of up to 79 acres of aquatic habitat and 58 acres of nesting and overwintering habitat for the western pond turtle in the study area (see Table 12-4-23). The majority of the permanent loss of aquatic habitat and nesting and overwintering habitat would be near Clifton Court Forebay in CZ 8. Refer to the Terrestrial Biology Map Book for a detailed view of Alternative 4 construction locations. The aquatic habitat in the Clifton Court Forebay area is considered to be of reasonably high-value because it consists of agricultural ditches in or near known species occurrences. The nesting and overwintering and dispersal habitat that would be lost consists primarily of cultivated lands with some small portion of ruderal grassland habitat. Except for remnant, uncultivated patches, the cultivated lands are not suitable for nesting and overwintering unless left fallow. Construction of the water conveyance facilities would also affect dispersal habitat, which is primarily cultivated lands. However, the long, linear nature of the pipeline footprint would minimize this effect.

Alternative 4 with the east-west transmission line option would reduce aquatic impacts by 17 acres and reduce upland impacts by 19 acres.

- *CM2 Yolo Bypass Fisheries Enhancement*: Improvements in the Yolo Bypass would result in the permanent removal of approximately 48 acres of aquatic habitat and 129 acres of upland nesting and overwintering habitat for the western pond turtle (Table 12-4-23). Improvements would also result in the temporary disturbance to 22 acres of aquatic habitat and 45 acres of upland habitat for western pond turtle in the study area. Although there are no CNDDB occurrences for western pond turtle in the Yolo Bypass, the species is known to be present in the Yolo Bypass Wildlife Area (California Department of Fish and Game 2008b).

- *CM4 Tidal Natural Communities Restoration*: Tidal natural communities restoration would result in the conversion of approximately 45 acres of aquatic habitat and 956 acres of upland nesting and overwintering habitat for western pond turtle to tidal marsh (Table 12-4-23). Tidal habitat restoration is expected to change existing salinity and flow conditions rather than lead to complete loss of aquatic habitat. Restoration of tidal flow where habitat consists of the calm waters of managed freshwater ponds and wetlands could have an adverse effect on the western pond turtle. Tidal restoration outside Suisun Marsh is likely to create suitable, slow-moving freshwater slough and marsh habitat.

  Although the aquatic habitat model includes all tidal perennial aquatic, tidal brackish emergent wetland, and managed wetland as habitat, nearly all Suisun Marsh pond turtle observations have been in drainage ditches or near water control structures (Patterson pers. comm.). While the model does not include an aquatic class type called *drainage ditches* and, therefore, an effect on this habitat type cannot be calculated, it is likely that this general type of habitat accounts for a very small portion of the total modeled aquatic habitat affected by tidal restoration in Suisun Marsh. The suitable nesting and overwintering habitat that would be affected in the interior of Suisun Marsh is limited, because the levees likely function as the primary nesting and overwintering habitat. The highest value nesting and overwintering habitat that would be affected is on the fringe of the marsh where the aquatic habitat is adjacent to undeveloped grassland habitat.

  The upland habitat affected in the interior Delta (west Delta and south Delta) consists of levees and intensively farmed agricultural plots. The Cache Slough and Cosumnes-Mokelumne upland areas that would be affected are less intensively farmed and have higher-value habitat for the turtle. Because the estimates of the effect of tidal inundation are based on projections of where restoration may occur, actual effects are expected to be lower because sites would be selected to minimize effects on western pond turtle habitat (see AMM17 in BDCP Appendix 3.C).

- *CM5 Seasonally Inundated Floodplain Restoration*: Levee construction associated with floodplain restoration in the south Delta (CZ 7) would result in the permanent removal of approximately 32 acres and temporary removal of 21 acres of aquatic habitat and permanent removal of 15 acres and temporary removal of 16 acres of upland habitat for western pond turtle. Approximately 2 miles of channels providing western pond turtle movement habitat would be removed as a result of floodplain restoration. As with CM4, the estimates of the effect of seasonal floodplain levee construction and inundation are based on projections of where restoration may occur. Actual effects are expected to be lower because sites would be selected to minimize effects on western pond turtle habitat.

- *CM11 Natural Communities Enhancement and Management*: As described in the BDCP, restoration of up to 25,100 acres of aquatic habitat and up to 2,000 acres of upland habitat, and protection of up to 53,405 acres of upland habitat, would benefit the western pond turtle (Table 12-4-23). A variety of habitat management actions included in CM11 that are designed to enhance wildlife values in BDCP protected habitats may result in localized ground disturbances that could temporarily remove small amounts of western pond turtle habitat. Ground-disturbing activities, such as removal of nonnative vegetation and road and other infrastructure maintenance, are expected to have minor adverse effects on available western pond turtle habitat and are expected to result in overall improvements to and maintenance of western pond turtle habitat values over the term of the BDCP. In addition, effects would be avoided and minimized by the AMMs listed below.
- Operations and maintenance: Ongoing maintenance of BDCP facilities is expected to have little if any adverse effect on the western pond turtle. Postconstruction operation and maintenance of the above-ground water conveyance facilities and restoration infrastructure could result in ongoing but periodic disturbances that could affect western pond turtle use where there is suitable habitat in the study area. Maintenance activities would include vegetation management, levee and structure repair, and regrading of roads and permanent work areas. These effects, however, would be minimized by AMMs and conservation actions described below.
- Injury and direct mortality: Construction vehicle activity may cause injury to or mortality of western pond turtles. If turtles reside where conservation measures are implemented (most likely in the vicinity of aquatic habitats in the study area), the operation of equipment for land clearing, construction, conveyance facilities operation and maintenance, and habitat restoration, enhancement, and management could result in injury or mortality of western pond turtles. However, to avoid injury or mortality, preconstruction surveys would be conducted in suitable aquatic or upland nesting and overwintering habitat for the western pond turtle, and turtles found would be relocated outside the construction areas, as required by the AMMs listed below.

The following paragraphs summarize the combined effects discussed above, describe other BDCP conservation actions that offset or avoid these effects, and provide NEPA and CEQA impact conclusions.

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the effects of construction would not be adverse under NEPA.

Alternative 4 would remove 243 acres of aquatic habitat and 723 acres of upland nesting and overwintering habitat for western pond turtle in the near-term. These effects would result from water conveyance facilities construction (CM1), Yolo Bypass improvements (CM2), tidal habitat restoration (CM4), and seasonally inundated habitat restoration (CM5) (Table 12-4-23).

Typical NEPA project-level mitigation ratios for aquatic habitats (1:1 for restoration) and for upland habitats (2:1 for protection) for affected natural communities would indicate that 243 acres of aquatic communities should be restored and up to 1,446 acres of upland habitats should be protected to mitigate for near-term habitat losses.

The conservation strategy for western pond turtle involves restoration and protection of aquatic and adjacent upland habitat, and establishment of an interconnected reserve system that provides for western pond turtle dispersal. The habitat protection and restoration needs for this species are addressed at the landscape and natural community levels. The BDCP has committed to near-term restoration of up to 8,100 acres of aquatic habitat and up to 1,140 acres of upland habitat, and to protection of up to 16,900 acres of upland habitat. In addition, the protection and management of existing managed wetland habitat in Suisun Marsh may increase the value of aquatic habitat. The most beneficial restoration would occur in freshwater emergent wetland consisting of slow-moving slough and marsh adjacent to protected, undisturbed grassland. Aquatic features (e.g., ditches and ponds) and adjacent uplands that are preserved and managed as part of the 45,405 acres of agricultural preserve are also expected to benefit the species. Additionally, basking platforms will be installed as needed in restored freshwater marsh to benefit the western pond turtle.

Furthermore, the plan's landscape-scale goals and objectives would inform the near-term protection and restoration efforts. The natural community restoration and protection activities are expected to be concluded in the first 10 years of plan implementation, which is close enough in time to the impacts of construction to constitute adequate mitigation for NEPA purposes. These commitments are more than sufficient to support the conclusion that the near-term effects of Alternative 4 would be not be adverse under NEPA, because the number of acres required to meet the typical ratios described above would be only 243 acres of aquatic communities restored and 1,446 acres of upland communities protected.

The plan also contains commitments to implement *AMM1 Worker Awareness Training*, *AMM2 Construction Best Management Practices and Monitoring*, *AMM3 Stormwater Pollution Prevention Plan*, *AMM4 Erosion and Sediment Control Plan*, *AMM5 Spill Prevention, Containment, and Countermeasure Plan*, *AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan*, *AMM10 Restoration of Temporarily Affected Natural Communities*, and *AMM17 Western Pond Turtle*. These AMMs include elements that would avoid or minimize the risk of affecting habitats and species adjacent to work areas and disposal sites. The AMMs are described in detail in BDCP Appendix 3.C.

Late Long-Term Timeframe

Based on the habitat model, the study area supports approximately 81,636 acres of aquatic and 28,963 acres of upland habitat for giant garter snake. Alternative 4 would remove 296 acres of aquatic habitat and 1,380 acres of upland nesting and overwintering habitat for western pond turtle in the late long-term.

Implementation of Alternative 4 as a whole would increase the extent and distribution of high-value aquatic and upland nesting and overwintering habitat for western pond turtle in the study area. While the extent of dispersal habitat is expected to be reduced by approximately 9%, this habitat is abundant in the study area (composed primarily of cultivated lands), is not believed to be a factor limiting the turtle, and would be replaced with higher-value habitats for western pond turtle.

The BDCP has committed to restoration of up to 25,100 acres of aquatic habitat and up to 2,000 acres of upland habitat, and to protection of at least 53,405 acres of upland habitat (including cultivated lands and grassland). In addition, the protection and management of existing managed wetland habitat in Suisun Marsh has potential to increase the value of aquatic habitat. Restored emergent wetland that would most benefit the species would be freshwater emergent wetland consisting of slow-moving slough and marsh adjacent to protected, undisturbed grassland. Those aquatic features (e.g., ditches and ponds) and adjacent uplands that are preserved and managed as part of the 45,405 acres of agricultural preserve are also expected to benefit the species. Additionally, basking platforms would be installed as needed in restored freshwater marsh to benefit the western pond turtle.

Riparian and floodplain restoration would potentially increase the quantity and value of aquatic and nesting and overwintering habitat. Where the floodplain is widened and restored, this would allow oxbows and slow-moving side channels to form, providing suitable aquatic habitat for this species (Bury and Germano 2008; Ernst and Lovich 2009). Where riparian vegetation is restored adjacent to slower-moving channels, sloughs, and ponds, downed trees can provide important basking habitat and cover habitat for turtles. Riparian restoration in those more interior portions of Old and Middle Rivers that would be managed for riparian brush rabbit habitat have potential to benefit resident western pond turtles as riparian-adjacent grassland is an important habitat characteristic for the rabbit.

The Plan Area represents only a small portion of the range of the western pond turtle in California (which includes most all the Pacific drainages) and southern Oregon. Effects from permanent and temporary loss or conversion of habitat for the western pond turtle, and other effects described above, are not expected to result in an adverse effect on the long-term survival and recovery of western pond turtle because for the following reasons.

- The Plan Area represents a small portion of the species' entire range.
- Only 1% of the habitat in the Plan Area would be removed or converted.

The loss of western pond turtle habitat associated with Alternative 4 as a whole would represent an adverse effect as a result of habitat modification of a special-status species and the potential for direct mortality of turtles. However, considering the habitat restoration and protection associated with the conservation components, guided by landscape-scale goals and objectives and AMM1–AMM6, AMM10, and AMM17, which would be in place throughout the construction phase, the loss of habitat and potential mortality would not have an adverse effect on western pond turtle.

CEQA Conclusion:

Near-Term Timeframe

Because *CM1 Water Facilities and Operation* construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the impacts of construction would be less than significant under CEQA.

Alternative 4 would remove 243 acres of aquatic habitat and 723 acres of upland nesting and overwintering habitat for western pond turtle in the near-term. These impacts would result from water conveyance facilities construction (CM1), Yolo Bypass improvements (CM2), tidal habitat restoration (CM4), and seasonally inundated habitat restoration (CM5) (Table 12-4-23).

Typical CEQA project-level mitigation ratios for aquatic habitats (1:1 for restoration) and for upland habitats (2:1 for protection) for impacted natural communities would indicate that 243 acres of aquatic communities should be restored and 1,446 acres of upland habitats should be protected to mitigate for near-term habitat losses.

The conservation strategy for western pond turtle involves restoration and protection of aquatic and adjacent upland habitat, and establishment of an interconnected reserve system that provides for western pond turtle dispersal. The habitat protection and restoration needs for this species are addressed at the landscape and natural community levels. The BDCP has committed to near-term restoration of up to 8,100 acres of aquatic habitat and up to 1,140 acres of upland habitat, and to protection of up to 16,900 acres of upland habitat. In addition, the protection and management of existing managed wetland habitat in Suisun Marsh may increase the value of aquatic habitat. The most beneficial restoration would occur in freshwater emergent wetland consisting of slow-moving slough and marsh adjacent to protected, undisturbed grassland. Aquatic features (e.g., ditches and ponds) and adjacent uplands that are preserved and managed as part of the 45,405 acres of agricultural preserve are also expected to benefit the species. Additionally, basking platforms will be installed as needed in restored freshwater marsh to benefit the western pond turtle.

Furthermore, the plan's landscape-scale goals and objectives would inform the near-term protection and restoration efforts. The natural community restoration and protection activities are expected to be concluded in the first 10 years of plan implementation, which is close enough in time to the impacts of construction to constitute adequate mitigation for CEQA purposes. These commitments are more than sufficient to support the conclusion that the near-term effects of Alternative 4 would be less than significant under CEQA, because the number of acres required to meet the typical ratios described above would be only 243 acres of aquatic communities restored and 1,446 acres of upland communities protected.

The plan also contains commitments to implement AMM1-6, AMM10, and AMM17 to avoid or minimize the risk of affecting habitats and species adjacent to work areas and disposal sites. The AMMs are described in detail in BDCP Appendix 3.C.

Late Long-Term Timeframe

Based on the habitat model, the study area supports approximately 81,636 acres of aquatic and 28,963 acres of upland habitat for western pond turtle. Alternative 4 would remove 296 acres of aquatic habitat and 1,380 acres of upland nesting and overwintering habitat for western pond turtle in the late long-term.

Implementation of Alternative 4 as a whole would increase the extent and distribution of high-value aquatic and upland nesting and overwintering habitat for western pond turtle in the study area. While the extent of dispersal habitat is expected to be reduced by approximately 1%, this habitat is abundant in the study area (composed primarily of cultivated lands), is not believed to be a factor limiting the turtle, and would be replaced with higher-value habitats for western pond turtle.

The BDCP has committed to restoration of up to 25,100 acres of aquatic habitat and up to 2,000 acres of upland habitat, and to protection of at least 53, 405 acres of upland habitat (including cultivated lands and grassland). In addition, the protection and management of existing managed wetland habitat in Suisun Marsh has potential to increase the value of aquatic habitat. Restored emergent wetland that would most benefit the species would be freshwater emergent wetland consisting of slow-moving slough and marsh adjacent to protected, undisturbed grassland. Those aquatic features (e.g., ditches and ponds) and adjacent uplands that are preserved and managed as part of the 45,405 acres of agricultural preserve are also expected to benefit the species. Additionally, basking platforms would be installed as needed in restored freshwater marsh to benefit the western pond turtle.

Riparian and floodplain restoration would potentially increase the quantity and value of aquatic and nesting and overwintering habitat. Where the floodplain is widened and restored, this would allow oxbows and slow-moving side channels to form, providing suitable aquatic habitat for this species (Bury and Germano 2008; Ernst and Lovich 2009). Where riparian vegetation is restored adjacent to slower-moving channels, sloughs, and ponds, downed trees can provide important basking habitat and cover habitat for turtles. Riparian restoration in those more interior portions of Old and Middle Rivers that would be managed for riparian brush rabbit habitat have potential to benefit resident western pond turtles because riparian-adjacent grassland is an important habitat characteristic for the rabbit.

The Plan Area represents only a small portion of the range of the western pond turtle in California (which includes most all the Pacific drainages) and southern Oregon. Effects from permanent and temporary loss or conversion of habitat for the western pond turtle, and other effects described above, are not expected to result in an adverse effect on the long-term survival and recovery of western pond turtle because for the following reasons.

- The Plan Area represents a small portion of the species' entire range.
- Only 1% of the habitat in the Plan Area would be removed or converted.

The loss of western pond turtle habitat associated with Alternative 4 as a whole would represent an adverse effect as a result of habitat modification of a special-status species and the potential for direct mortality of turtles. However, considering the habitat restoration and protection associated with the conservation components, guided by landscape-scale goals and objectives and AMM1–AMM6, AMM10, and AMM17, which would be in place throughout the construction phase, the loss of habitat and potential mortality would not have an adverse effect on western pond turtle. Therefore, the loss of western pond turtle habitat and potential mortality of turtles would have a less-than-significant impact on western pond turtle.

Impact BIO-53: Indirect effects of plan implementation on western pond turtle

Construction activities associated with water conveyance facilities, conservation components and ongoing habitat enhancement, as well as operation and maintenance of above-ground water conveyance facilities, including the transmission facilities, could result in ongoing periodic postconstruction disturbances with localized impacts on western pond turtle habitat, and temporary noise and visual disturbances over the term of the BDCP. These potential adverse effects would be minimized and avoided through implementation of AMM1–AMM6, AMM10, and AMM17, all of which would be in effect during the BDCP's construction phase.

The use of mechanical equipment during water conveyance facilities construction could cause the accidental release of petroleum or other contaminants that could affect western pond turtle or its aquatic prey. The inadvertent discharge of sediment or excessive dust adjacent to western pond turtle aquatic habitat could also have a negative effect on the species or its prey. AMM1–AMM6, and AMM10 would minimize the likelihood of such spills occurring and would ensure measures are in place to prevent runoff from the construction area and potential adverse effects of sediment or dust on western pond turtle or its prey.

Indirect effects on western pond turtle within 200 feet of construction activities could temporarily affect the use of aquatic habitat and upland nesting, overwintering, and dispersal habitat for the western pond turtle.

Water operations would affect salinity gradients in Suisun Marsh. This effect mechanism cannot be disaggregated from tidal natural community restoration in Suisun Marsh. It is expected that the salinity of water in Suisun Marsh would generally increase as a result of water operations and operation of salinity control gates to mimic a more natural water flow. Results of modeling for full implementation of the BDCP show salinity to double by the late long-term compared with current conditions during late fall and winter months. Although they are often found in brackish marsh, western pond turtles are primarily a freshwater species and they could respond negatively to increased salinity in Suisun Marsh. Changes in salinity would not be uniform across Suisun Marsh, as salinity would likely be more pronounced in some tidal channels and sloughs than others, and most of the salinity increase would occur during the fall and winter when turtles may be overwintering in adjacent upland habitat although it may not get cold enough to trigger overwintering and they may spend the winter in uplands and ditches (Patterson pers. comm.). Ditches are expected to have lower salinity levels than sloughs as a result of freshwater additions in adjacent managed wetlands. Therefore, the potential adverse effects associated with changes in salinity are not expected to adversely affect western pond turtles.

Exposure to methylmercury as a result of tidal habitat restoration (CM4) could adversely affect the western pond turtle. Methylmercury is known to affect aquatic and wetland wildlife species, though investigations have not focused on determining effects of exposure to methylmercury on reptiles. Tidal wetlands are known to produce methylmercury, and western pond turtles that inhabit these wetlands may be exposed to greater levels of methylmercury than in other study area wetland habitats. Exposure to methylmercury in Suisun Marsh, however, may decrease as a result of converting managed wetlands to tidal wetlands. The Suisun Marsh Plan (U.S. Bureau of Reclamation et al. 2010) anticipates that tidal wetlands restored under the plan would generate less methylmercury than the existing managed wetlands produce. The effects of any increased exposure on western pond turtle, however, are not known. Implementation of *CM12 Methylmercury Management* is expected to reduce the effects of potential increases methylmercury levels resulting from BDCP tidal habitat restoration actions.

Implementation of the AMMs listed above as part of implementing Alternative 4 would avoid the potential for substantial adverse effects on western pond turtles, either directly or through habitat modifications. These AMMs would also avoid and minimize effects that could substantially reduce the number of western pond turtles or restrict the species range. Therefore, the indirect effects of Alternative 4 would not have an adverse effect on western pond turtle.

CEQA Conclusion: Indirect effects resulting from conservation measure operations and maintenance as well as construction-related noise and visual disturbances could impact western pond turtle in aquatic and upland habitats. The use of mechanical equipment during construction could cause the accidental release of petroleum or other contaminants that could affect western pond turtle or its prey. The inadvertent discharge of sediment or excessive dust adjacent to western pond turtle habitat could also have a negative effect on the species or its prey. Changes in water salinity would have a less-than-significant impact on western pond turtles because most of the salinity increases would be during the time of year when turtles are in upland habitat. Western pond turtle could experience indirect effects from increased exposure to methylmercury as a result of tidal habitat restoration (CM4). With implementation of CM12, the potential indirect effects of methlymercury would not result in a substantial reduction in numbers or a restriction in the range of the species, and, therefore, would have a less-than-significant impact on western pond turtle.

With implementation of AMM1–AMM6, AMM10, and AMM17 as part of Alternative 4 construction, operation, and maintenance, the BDCP would avoid the potential for substantial adverse effects on western pond turtles, either indirectly or through habitat modifications, and would not result in a substantial reduction in numbers or a restriction in the range of western pond turtles. The indirect effects of BDCP Alternative 4 would have a less-than-significant impact on western pond turtles.

Impact BIO-54: Periodic effects of inundation of western pond turtle habitat as a result of implementation of conservation components

Flooding of the Yolo Bypass from *CM2 Yolo Bypass Fisheries Enhancement* would periodically affect 94–154 acres of aquatic habitat and 228–523 acres of upland habitat for western pond turtle (Table 12-4-23). Flooding of the Yolo Bypass is currently a frequent event during winter and spring along the eastern edge of Yolo Bypass, with at least one inundation event recorded in about 70% of all years. The entire bypass floods in extreme flood events. There would be no adverse effects from inundation of flooding in the Yolo Bypass or in restored floodplains on the western pond turtle's aquatic and dispersal habitat areas because both areas would continue to function as aquatic and dispersal habitat. Although there is potential for adverse effects resulting from periodic inundation on turtle hatchlings if western pond turtles nest in the inundation zone and the hatchlings are found to overwinter in the nest, effects would be offset through implementation of other BDCP conservation components that would provide a substantial net benefit to the western pond turtle through the increase in available aquatic and nesting and overwintering habitat, habitat value, and habitat in protected status.

CM5 Seasonally Inundated Floodplain Restoration would periodically inundate 75 acres of aquatic habitat and 404 acres of upland habitat for the western pond turtle in the south Delta (CZ 7). Based on modeled habitat, the study area supports approximately 81,636 acres of aquatic and 28,963 acres of upland habitat for western pond turtle. Approximately 75 acres of aquatic habitat (less than 1% of the total in the study area) and up to 404 acres of upland habitat (1% of total in the study area) may be adversely affected by periodic flooding as a consequence of floodplain restoration. Seasonal flooding in restored floodplains is not expected to adversely affect aquatic and dispersal habitat, because these habitat functions are expected to remain in the seasonally inundated floodplains. Floodplains are not expected to be inundated during the nesting season, however, turtle hatchlings may overwinter in the nest and could be affected by flooding. Restored floodplains would transition for areas that flood frequently (e.g., every 1 to 2 years) to areas that flood infrequently (e.g., every 10 years or more); adverse effects on turtle hatchlings are most likely at the lower elevations of the restored floodplain, where frequent flooding occurs.

Periodic effects on aquatic and upland habitat for western pond turtle associated with implementing Alternative 4 are not expected to result in substantial adverse effects either directly or through habitat modifications, as it would not result in a substantial reduction in numbers or a restriction in the range of western pond turtles. Therefore, Alternative 4 would not adversely affect the species.

CEQA Conclusion: Flooding of the Yolo Bypass from CM2 and creation of seasonally inundated floodplain in various parts of the study area (CM5) would periodically affect a total of up to 229 acres of aquatic habitat and up to 927 acres of upland habitat for western pond turtle These acreages are a small proportion of the aquatic and upland western pond turtle habitat in the study area. Most of the increase in inundation would occur in the winter and early spring months, when western pond turtles may be in the water or overwintering and occupying upland habitats. Therefore, implementing Alternative 4, including AMM1–AMM6, AMM10, and AMM17, would not be expected to result in substantial adverse effects on western pond turtle, either directly or through habitat modifications, because it would not result in a substantial reduction in numbers or a restriction in the range of western pond turtles. Periodic effects of inundation under Alternative 4 would have a less-than-significant impact on the species.

Silvery Legless Lizard, San Joaquin Whipsnake, and California Horned Lizard

This section describes the effects of Alternative 4 on the silvery legless lizard, San Joaquin whipsnake, and California horned lizard (special-status reptiles). The habitat types used to assess effects on silvery legless lizard are limited to inland sand dunes near Antioch (CZ 9 and 10), which would not be affected by construction or restoration activities. This species is not discussed any further.

The habitat types used to assess effects on the San Joaquin whipsnake are alkali seasonal wetland complex, grassland, and inland dune scrub west of Byron Highway (CZ 7)and west of Old River and West Canal (CZ 8). The habitat types used to assess effects on the California horned lizard are the same as those for the whipsnake in CZ 7 and CZ 8. There is also potential habitat for the horned lizard to occur in grassland habitat around Stone Lake (CZ 4) Although the expected range for San Joaquin whipsnake and California horned lizard extends into the study area, there are no records for either of these species within the study area (California Department of Fish and Game 2012bb, 2012cc).

Implementation of Alternative 4 as a whole would benefit these species. Alternative 4 would expand and enhance habitats associated with potential habitat areas, provide protected habitat corridors to facilitate movement, and provide conditions that are favorable, relative to the existing condition of primarily cultivated lands, for maintaining, expanding, and increasing the distribution and abundance of these species in suitable habitat.

BDCP actions that could affect this habitat are limited to construction and maintenance of the water conveyance facilities in the vicinity of Clifton Court Forebay, and grassland restoration, protection and management. Separately, implementation of conservation components would result in the restoration of 2,000 acres of grassland within CZ 1, CZ 8, or CZ 11 (Table 12-4-24). To the extent that grassland habitat is restored in CZ 8, this action would provide grassland habitat for both species that is contiguous with more extensive protected habitat outside of the Plan Area. In contrast to the removed grasslands, the grasslands to be protected, enhanced, and restored occur in areas of historical natural grassland vegetation, much of which is within the range of the both species. Additionally, BDCP conservation components would protect at least 2,000 acres of existing unprotected grassland habitat in CZ 8. With restoration and protection of this habitat, impacts on San Joaquin whipsnake and California horned lizard would not be adverse for NEPA purposes and would be less than significant for CEQA purposes.

Table 12-4-24. Changes in Special-Status Reptile Habitat Associated with Alternative 4 (acres)[a]

	Conservation Measure[b]	Habitat Type	Permanent		Temporary		Periodic[d]	
			NT	LLT	NT	LLT	Yolo	Floodplain
Habitat Affected[c]	CM1	Grassland	327	327	44	44	NA	NA
	Total Impacts CM1		**327**	**327**	**44**	**44**	**NA**	**NA**
	CM2–CM18	Grassland	0	0	0	0	0	0
	Total Impacts CM2–CM18		**0**	**0**	**0**	**0**	**0**	**0**

	TOTAL IMPACTS	**327**	**327**	**44**	**44**	**0**	**0**
Habitat Restored/ Created[e]	CM8: Grassland	1,140	2,000	NA	NA	NA	NA
	Total Restoration/Creation	**1,140**	**2,000**	**0**	**0**	**NA**	**NA**
Habitat Protected[e]	CM3: Grassland	2,000	2,000	0	0	NA	NA
	Total Protection	**2,000**	**2,000**	**0**	**0**	**NA**	**NA**

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late long-term timeframes.

[b] See discussion below for a description of applicable CMs.

[c] LLT acreages are a summation of effects that would occur in the near-term, early long-term and late long-term timeframes. The LLT acreages represent the total amount of habitat that would be affected over the 50-year life of the BDCP and do not reflect habitat increases that would result from restoration, creation and protection activities.

[d] Periodic effects were estimated for the late long-term only. Yolo periodic impacts are presented as a range based on different flow regimes at the proposed notch in Fremont Weir.

[e] Restored/created and protected habitat acreages represent planned conservation activities that would be implemented over the lifetime of the BDCP (see BDCP Chapter 3, *Conservation Strategy*, for specifics).

NT = near-term

LLT = late long-term

NA = not applicable

Impact BIO-55: Loss or conversion of habitat for and direct mortality of special-status reptiles

Alternative 4 conservation measures would result in a total loss of 371 acres of potential habitat for special-status reptiles (Table 12-4-24). Water conveyance facilities and transmission line construction, including establishment and use of borrow and spoil areas, (CM1) would cause the loss of special-status reptile habitat. In addition, habitat enhancement and management activities (CM11), such as ground disturbance or removal of nonnative vegetation, could result in local adverse habitat effects for special-status reptiles. For purposes of this analysis, the acres of total effects are considered the same for both San Joaquin whipsnake and California horned lizard, even though there would be a few more acres of temporary effect on the California horned lizard resulting from activities in CZ 4.

In addition to habitat loss and conversion, construction activities, such as grading, the movement of construction vehicles or heavy equipment, and the installation of water conveyance facilities components and new transmission lines, may result in the direct mortality, injury, or harassment of special-status reptiles, including the potential crushing of individuals and disruption of essential behaviors. Construction of access roads could fragment suitable habitat, potentially impede upland movements in some areas, and increase the risk of road mortality. Construction activities related to conservation components could have similar affects. Each activity that would have an effect is described below. A summary of the combined effects and NEPA and CEQA conclusions follow the individual conservation measure discussions.

- *CM1 Water Facilities and Operation*: Development of the conveyance facilities would result in the permanent loss of approximately 327 acres of habitat for special-status reptiles in the vicinity of Clifton Court Forebay. Construction-related effects would temporarily disturb 44 acres of suitable habitat for special-status reptiles in the study area.

Under the east-west transmission line option, there would be change in impacts on special-status reptiles. *CM8 Grassland Natural Community Restoration*: Grassland restoration would provide for the restoration of 2,000 acres of grassland within CZ 1, CZ 8, or CZ 11. Protection of at least 1,000 acres of the total 2,000 acres of grassland habitat in CZ 8 is expected to benefit special-status reptiles that could be present by protecting existing upland cover and dispersal habitat from potential loss or degradation that otherwise could occur with future changes in existing land use. To the extent that grassland habitat is restored in CZ 8, this action would remove low-value special-status reptile habitat, such as cultivated lands, and replace it with high-value cover, foraging, and dispersal habitat.

- *CM11 Natural Communities Enhancement and Management*: A variety of habitat management actions included in *CM11* that are designed to enhance wildlife values in BDCP-protected habitats may result in localized ground disturbances that could temporarily remove small amounts of special-status reptile habitat. Ground-disturbing activities, such as removal of nonnative vegetation and road and other infrastructure maintenance, are expected to have minor adverse effects on available special-status reptile habitat and are expected to result in overall improvements to and maintenance of species habitat values over the term of the BDCP. These effects cannot be quantified, but are expected to be minimal and would be reduced through implementation of Mitigation Measure BIO-55.
- Operations and maintenance: Ongoing facilities operation and maintenance is expected to have little if any adverse effect on special-status reptiles. Postconstruction operation and maintenance of the above-ground water conveyance facilities could result in ongoing but periodic disturbances that could affect special-status reptiles' use of suitable habitat in the Plan Area. These effects, however, would be minimized with implementation of Mitigation Measure BIO-55.
- Injury and direct mortality: Construction vehicle activity may cause injury to or mortality of special-status reptiles. The operation of equipment for land clearing, construction, operation and maintenance, and restoration, enhancement, and management activities could result in injury or mortality. This risk is highest from late fall through early spring, when special-status reptiles are not as active. Increased vehicular traffic associated with BDCP actions could contribute to a higher incidence of road kill. However, conducting construction during the late-spring through early fall periods when feasible and implementation of Mitigation Measure BIO-55 would avoid and minimize injury or mortality of special-status reptiles during construction.

The following paragraphs summarize the effects discussed above, describe BDCP conservation actions that would offset or avoid these effects, and provide NEPA and CEQA conclusions.

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the construction effects would not be adverse under NEPA.

Alternative 4 would remove 371 acres of grassland habitat for special-status reptiles. The typical NEPA mitigation ratio (2:1 for protection) for this natural community would indicate that 742 acres should be protected in the near-term to offset CM1 losses.

The BDCP has committed to near-term restoration of up to 1,140 acres of grassland and protection of up to 2,000 acres of grassland in the Plan Area. These conservation provisions would be implemented in the same timeframe as CM1 construction and early restoration losses, thereby avoiding effects on special-status reptiles. The acres to be protected in the near-term would exceed the typical mitigation ratios that would be applied to the project-level effects of CM1.

Considering the BDCP conservation strategy and the implementation of Mitigation Measure BIO-55, the permanent and temporary loss of special-status reptile habitat and the potential mortality of either species would not be an adverse effect.

Late Long-Term Timeframe

Alternative 4 as a whole would result in the permanent loss of 371 acres of habitat for special-status reptiles over the life of the plan. Effects of water conveyance facilities construction would be offset through the plan's long-term commitment to protect up to 2,000 acres of grassland, and grassland associated with alkali seasonal wetlands and vernal pool complexes, and to restore 2,000 acres of grassland in the Plan area. Grassland protection would focus in particular on acquiring the largest remaining contiguous patches of unprotected grassland habitat, which are located south of SR 4 in CZ 8 (Appendix 2.A, *Covered Species Accounts*). This area connects to more than 620 acres of existing habitat that is protected under the East Contra Costa County HCP/NCCP.

Other effects would be reduced through implementation of Mitigation Measure BIO-55. The plan as a whole is expected to benefit special-status reptiles that could be present by protecting potential habitat from loss or degradation that otherwise could occur with future changes in existing land use. To the extent that grassland habitat is restored in CZ 8, restoration would remove low-value special-status reptile habitat, such as cultivated land, and replace it with high-value cover, foraging, and dispersal habitat. The overall effect would be beneficial because the plan would result in a net increase in acreage of grassland habitat in the Plan Area.

BDCP's commitment to protect the largest remaining contiguous habitat patches (including grasslands and the grassland component of alkali seasonal wetland and vernal pool complexes) in CZ 8 would sufficiently offset the adverse effects resulting from water conveyance facilities construction. Considering the BDCP conservation strategy and the implementation of Mitigation Measure BIO-55, the permanent and temporary loss of special-status reptile habitat and the potential mortality of either species would not be an adverse effect under NEPA.

CEQA Conclusion:

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the construction impacts would be less than significant under CEQA.

Alternative 4 would remove 371 acres of grassland habitat for special-status reptiles. The typical CEQA mitigation ratio (2:1 for protection) for this natural community would indicate that 742 acres should be protected in the near-term to offset CM1 losses.

The BDCP has committed to near-term restoration of up to 1,140 acres of grassland and protection of up to 2,000 acres of grassland in the Plan Area. The acres to be protected in the near-term would exceed the typical mitigation ratios that would be applied to the project-level effects of CM1.

The natural community restoration and protection activities are expected to be concluded during the first 10 years of plan implementation, which would is close enough to the timing of construction impacts to constitute mitigation for CEQA purposes. Considering the BDCP conservation strategy and the implementation of Mitigation Measure BIO-55, the permanent and temporary loss of special-status reptile habitat and the potential mortality of either species would be a less-than-significant impact under CEQA.

Late Long-Term Timeframe

Alternative 4 as a whole would result in the permanent loss of 371 acres of habitat for special-status reptiles over the life of the plan. Effects of water conveyance facilities construction would be offset through the plan's long-term commitment to protect up to 2,000 acres of grassland, and grassland associated with alkali seasonal wetlands and vernal pool complexes, and to restore 2,000 acres of grassland in the Plan area. Grassland protection would focus in particular on acquiring the largest remaining contiguous patches of unprotected grassland habitat, which are located south of SR 4 in CZ 8 (Appendix 2.A, *Covered Species Accounts*). This area connects to more than 620 acres of existing habitat that is protected under the East Contra Costa County HCP/NCCP.

Other effects would be reduced through implementation of Mitigation Measure BIO-55 *Conduct preconstruction surveys for noncovered special-status reptiles and implement applicable CM22 measures*. The plan as a whole is expected to benefit special-status reptiles that could be present by protecting potential habitat from loss or degradation that otherwise could occur with future changes in existing land use. To the extent that grassland habitat is restored in CZ 8, restoration would remove low-value special-status reptile habitat, such as cultivated land, and replace it with high-value cover, foraging, and dispersal habitat. The overall effect would be beneficial because the plan would result in a net increase in acreage of grassland habitat in the Plan Area.

BDCP's commitment to protect the largest remaining contiguous habitat patches (including grasslands and the grassland component of alkali seasonal wetland and vernal pool complexes) in CZ 8 would sufficiently offset the adverse effects resulting from water conveyance facilities construction. Considering the BDCP conservation strategy and the implementation of Mitigation Measure BIO-55, the permanent and temporary loss of special-status reptile habitat and the potential mortality of either species would not result in a significant impact under CEQA.

Mitigation Measure BIO-55: Conduct preconstruction surveys for noncovered special-status reptiles and implement applicable CM22 measures

The project applicant will retain a qualified biologist to conduct a habitat assessment in areas that are relatively undisturbed or have a moderate to high potential to support noncovered special-status reptiles (California horned lizard and San Joaquin whipsnake) in CZs 4, 7, and 8. The qualified biologist will survey for noncovered special-status reptiles in areas of suitable habitat concurrent with the preconstruction surveys for covered species in CZs 4, 7, and 8. If special-status reptiles are detected, the biologist will passively relocate the species out of the work area prior to construction if feasible.

In addition, *CM22 Avoidance and Minimization Measures*, specifically *AMM1 Worker Awareness Training*, *AMM2 Construction Best Management Practices and Monitoring*, and *AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan*, will be implemented for all noncovered special-status reptiles adversely affected by the BDCP to avoid, minimize, or compensate for impacts.

Impact BIO-56: Indirect effects of plan implementation on special-status reptile species

Construction activities associated with water conveyance facilities, conservation components and ongoing habitat enhancement, as well as operations and maintenance of above-ground water conveyance facilities, including the transmission facilities, could result in ongoing periodic postconstruction disturbances and noise with localized effects on special-status reptiles and their habitat over the term of the BDCP. Mitigation Measure BIO-55.

In addition, construction activities could indirectly affect special-status reptiles if construction resulted in the introduction of invasive weeds that create vegetative cover that is too dense for the species to navigate. Construction vehicles and equipment can transport in their tires and various parts under the vehicles invasive weed seeds and vegetative parts from other regions to construction sites, resulting in habitat degradation. These potential adverse effects would be reduced through implementation of AMM11.

Water conveyance facilities operations and maintenance activities would include vegetation and weed control, ground squirrel control, canal maintenance, infrastructure and road maintenance, levee maintenance, and maintenance and upgrade of electrical systems. While maintenance activities are not expected to remove special-status reptile habitat, operation of equipment could disturb small areas of vegetation around maintained structures and could result in injury or mortality of individual special-status reptiles, if present.

Implementation of the Mitigation Measure 53 and AMM11 would avoid the potential for substantial adverse effects on these species, either indirectly or through habitat modifications. The mitigation measures would also avoid and minimize effects that could substantially reduce the number of special-status reptiles, or restrict either species' range. Therefore, with implementation of Mitigating Measure BIO-55 AMM11, the indirect effects of Alternative 4 would not have an adverse effect on special-status reptiles.

CEQA Conclusion: Indirect effects from conservation measure operations and maintenance as well as construction-related noise and visual disturbances could impact special-status reptiles. In addition, construction activities could indirectly affect special-status reptiles if construction resulted in the introduction of invasive weeds that create vegetative cover that is too dense for the species to navigate. Water conveyance facilities operations and maintenance activities, such as vegetation and weed control, and road maintenance, are not expected to remove special-status reptile habitat, but operation of equipment could disturb small areas of vegetation around maintained structures and could result in injury or mortality of individual special-status reptiles, if present.

With implementation of Mitigation Measure BIO-55 and AMM11 as part of Alternative 4 construction, operation, and maintenance, the BDCP would avoid the potential for significant effects on special-status reptile species, either indirectly or through habitat modifications, and would not result in a substantial reduction in numbers or a restriction in the range of either species. With implementation of Mitigation Measure BIO-55 and AMM11, the indirect effects of BDCP Alternative 4 would have a less-than-significant impact on special-status reptiles.

Mitigation Measure BIO-55: Conduct preconstruction surveys for noncovered special-status reptiles and implement applicable CM22 measures

See description of Mitigation Measure BIO-55 under Impact BIO-55.

California Black Rail

The habitat model used to assess effects for the California black rail is based on primary breeding habitat and secondary habitat. Primary (breeding) habitat for this species within the Delta includes all *Schoenoplectus* and *Typha*-dominated tidal and nontidal freshwater emergent wetland in patches greater than 0.55 acre (essentially instream islands of the San Joaquin River and its tributaries and White Slough Wildlife Area). In Suisun Marsh, primary habitat includes all *Schoenoplectus* and *Typha*-dominated, and *Salicornia*-dominated patches greater than 0.55 acre, with the exception that all low marsh habitats dominated by *Schoenoplectus acutus* and *S. californicus* and all managed wetlands, in general, are considered secondary habitat with lesser ecological value. Upland transitional zones, providing refugia during high tides, within 150 feet of the tidal wetland edge were also included as secondary habitat. Secondary habitats generally provide only a few ecological functions such as foraging (low marsh and managed wetlands) or extreme high tide refuge (upland transition zones), while primary habitats provide multiple functions, including breeding, effective predator cover, and valuable foraging opportunities.

Construction and restoration associated with Alternative 4 conservation measures would result in both temporary and permanent losses of California black rail modeled habitat as indicated in Table 12-4-25. The majority of the losses would take place over an extended period of time as tidal marsh is restored in the study area. Full implementation of the BDCP would restore or create 16,900 acres of habitat for the California black rail (Table 12-4-25). As explained below, with the restoration or protection of these amounts of habitat, impacts on the California black rail would not be adverse for NEPA purposes and would be less than significant for CEQA purposes.

Table 12-4-25. Changes in California black rail Modeled Habitat Associated with Alternative 4 (acres)[a]

	Conservation Measure[b]	Habitat Type	Permanent		Temporary		Periodic[d]	
			NT	LLT	NT	LLT	Yolo	Floodplain
Habitat Affected[c]	CM1	Primary	1	1	0	0	NA	NA
		Secondary	2	2	1	1	NA	NA
	Total Impacts CM1		**3**	**3**	**1**	**1**		
	CM2–CM18	Primary	69	70	0	0	0	0
		Secondary	1,221	3,534	0	0	0	0
	Total Impacts CM2–CM18		**1,290**	**3,604**			**0**	**0**
	TOTAL IMPACTS		**1,293**	**3,607**	**1**	**1**	**0**	**0**
Habitat Restored/ Created[e]	CM4 tidal restoration		6,200	16,900	NA	NA	NA	NA
	Total Restoration/Creation		**6,00**	**16,900**				
Habitat Protected[e]	**Total Protection**							

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late long-term timeframes.
[b] See discussion below for a description of applicable CMs.
[c] LLT acreages are a summation of effects that would occur in the near-term, early long-term and late long-term

timeframes. The LLT acreages represent the total amount of habitat that would be affected over the 50-year life of the BDCP and do not reflect habitat increases that would result from restoration, creation and protection activities.

[d] Periodic effects were estimated for the late long-term only. Yolo periodic impacts are presented as a range based on different flow regimes at the proposed notch in Fremont Weir.

[e] Restored/created and protected habitat acreages represent planned conservation activities that would be implemented over the lifetime of the BDCP (See Chapter BDCP Chapter 3 *Conservation Strategy* for specifics).

NT = near-term
LLT = late long-term
NA = not applicable

Impact BIO-57: Loss or conversion of habitat for and direct mortality of California black rail

Alternative 4 conservation measures would result in the combined permanent and temporary loss of up to 71 acres of modeled primary habitat, and up to 3,536 acres of modeled secondary habitat for California black rail (Table 12-4-25). Conservation measures that would result in these losses are conveyance facilities and transmission line construction, and establishment and use of borrow and spoil areas (CM1) and tidal habitat restoration (CM4). Habitat enhancement and management activities (CM11), which include ground disturbance or removal of nonnative vegetation, could result in local adverse habitat effects. In addition, maintenance activities associated with the long-term operation of the water conveyance facilities and other BDCP physical facilities could degrade or eliminate California black rail habitat. Each of these individual activities is described below. A summary statement of the combined impacts and NEPA and CEQA conclusions follows the individual conservation measure discussions.

- *CM1 Water Facilities and Operation:* Construction of Alternative 4 conveyance facilities would result in the combined permanent and temporary loss of up to 4 acres of modeled California black rail habitat, composed of 1 acre of primary, and 3 acres of secondary habitat (Table 12-4-25). Of the 4 acres of modeled habitat that would be removed for the construction of the conveyance facilities, 1 acre would be a temporary loss of secondary habitat. Activities that would impact modeled habitat consist of consists of tunnel construction, temporary access roads, and construction of transmission lines in the central Delta in CZ 5 (between Bouldin and Venice Islands), CZ 6 (east of Bacon Island), and CZ 8 (at the north end of Coney Island). Refer to the Terrestrial Biology Map Book for a detailed view of Alternative 4 construction locations.

  The construction of the permanent east-west transmission line would not intersect with California black rail modeled habitat. The nearest modeled habitat is secondary habitat more than 1 kilometer away. Therefore, there would be no loss of modeled habitat resulting from the permanent transmission corridor if this option was selected. One acre of secondary habitat would be impacted by the construction of the temporary transmission lines with either the east-west or the north-south transmission line.

- *CM4 Tidal Natural Communities Restoration:* California black rail modeled habitat would be affected by tidal marsh restoration in various ways. Some California black rail modeled habitat would be permanently lost such that it no longer serves as habitat, while other modeled habitat would change value through conversion from one habitat type to another. Tidal habitat restoration site preparation and inundation would result in the permanent loss of 3,534 acres of secondary habitat and the conversion of 70 acres of primary habitat (middle and high marsh) to low marsh or secondary habitat. In addition, 16 acres of upland habitat would be converted to middle or high marsh, which represents a conversion from secondary to primary habitat for the species.

The majority of the effects of tidal natural communities restoration would occur in Suisun Marsh (CZ 11). Much of the natural wetland habitat that would be removed occurs in isolated patches and would be replaced by larger continuous areas of tidal wetlands that are expected to support higher habitat functions for the rail than the impacted wetlands. As described in the BDCP, restoration of up to 16,900 acres of tidal freshwater emergent and tidal brackish emergent wetland natural communities in the late long-term would benefit California black rail (Table 12-4-25). However, California black rails have a greater use of mature tidal marshes and, therefore, it would be years before the newly restored marshes provided suitable habitat for the species. The tidal natural communities restoration would be phased over a 40-year period to allow for recovery of some areas before initiating restoration actions in other areas. In the long-term, tidal natural communities restoration is expected to have little to no adverse effects on California black rail habitat because the habitat removed would be replaced by a greater acreage of high-value tidal wetland and, thus, is expected to provide a benefit for California black rail.

- *CM11 Natural Communities Enhancement and Management:* A variety of habitat management actions contained in *CM11 Natural Communities Enhancement and Management* that are designed to enhance wildlife values in restored and protected tidal wetland habitats may result in localized ground disturbances that could temporarily remove small amounts of California black rail habitat. Ground-disturbing activities, such as removal of nonnative vegetation and road and other infrastructure maintenance activities, are expected to have minor adverse effects on available California black rail habitat and are expected to result in overall improvements and maintenance of California black rail habitat values over the term of the BDCP. Noise and visual disturbances during implementation of habitat management actions could also result in temporary disturbances that affect California black rail use of the surrounding habitat. These effects cannot be quantified, but are expected to be minimal and would be avoided and minimized by the AMMs listed below.
- Operations and Maintenance: Postconstruction operation and maintenance of the above-ground water conveyance facilities and restoration infrastructure could result in ongoing but periodic disturbances that could affect California black rail use of the surrounding habitat in Suisun and the central Delta. Maintenance activities would include vegetation management, levee and structure repair, and re-grading of roads and permanent work areas. These effects, however, would be reduced by AMMs and conservation actions as described below.
- Injury and Direct Mortality: Construction vehicle activity may cause injury or mortality to California black rail. If rails are present adjacent to covered activities, the operation of equipment for land clearing, construction, conveyance facilities operation and maintenance, and habitat restoration, enhancement, and management could result in injury or mortality of California black rail. Increased vehicular traffic associated with BDCP actions could contribute to a higher incidence of road kill. However, conducting construction outside of the breeding season where feasible (reducing the risk of impacting active nests), construction monitoring, and other measures would be implemented to avoid and minimize injury or mortality of the species during construction, as required by AMMs listed below.

The following paragraphs summarize the combined effects discussed above and describe other BDCP conservation actions that offset or avoid these effects. NEPA and CEQA impact conclusions are also included.

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the effects of construction would not be adverse under NEPA and would be less than significant under CEQA. With Plan implementation, there would be a loss of 1,294 acres of modeled habitat for California black rail in the study area in the near-term. These effects would result from the construction of the water conveyance facilities (CM1, 1 acres of primary and 3 acres of secondary habitat), and implementing other conservation measures (tidal restoration [CM4], 69 acres of primary and 1,221 acres of secondary habitat).

Typical NEPA and CEQA project-level mitigation ratios for those natural communities affected by CM1 and that are identified in the biological goals and objectives for California black rail in Chapter 3 of the BDCP would be 1:1 for restoration/creation of tidal freshwater and tidal brackish emergent habitat. Using these typical ratios would indicate that 4 acres of tidal natural communities should be restored/created to mitigate for the CM1 losses of California black rail. There would be no offsetting acreage required if the east-west transmission line alignment was selected for Alternative 4. The near-term effects of other conservation actions would remove 1,290 acres of tidal natural communities, and therefore require 1,290 acres of tidal natural communities restoration using the same typical NEPA and CEQA ratios (1:1 for restoration/creation).

The BDCP has committed to near-term goals of restoring 6,200 acres of tidal freshwater emergent and tidal brackish emergent wetlands in the study area. These conservation actions would occur in the same timeframe as the construction and early restoration losses, thereby avoiding adverse effects on California black rail. To ensure that this natural community conservation benefits the species, the Plan's biological goals and objectives (BDCP Chapter 3, *Conservation Strategy*) further specify that within the 55,000 acres of restored, tidally influenced natural communities, in the late long-term, at least 3,000 acres of tidal brackish emergent wetland would be restored in CZ 11 among the Western Suisun/Hill Slough Marsh Complex, the Suisun Slough/Cutoff Slough Marsh Complex, and the Nurse Slough/Denverton Marsh complex as consistent with the final tidal marsh recovery plan. Of those 3,000 acres of tidal brackish emergent wetland, at least 1,500 acres of high and mid marsh would be distributed in CZ 11, In addition, within the late long-term goal of restoring at least 55,000 acres of tidally influenced natural communities, at least 13,900 acres of tidal freshwater emergent wetland in CZ 1, CZ 2, CZ 4, CZ 5, CZ 6, and/or CZ 7. In addition, tidal freshwater emergent wetlands would be restored in areas that increase connectivity among protected lands. These biological goals and objectives would inform the near-term restoration efforts. These Plan goals represent performance standards for considering the effectiveness of restoration actions. The acres of restoration contained in the near-term Plan goals and the additional detailed measures within CM4 satisfy the typical mitigation that would be applied to the project-level effects of CM1, as well as mitigating the near-term effects of the other conservation measures.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training*, *AMM2 Construction Best Management Practices and Monitoring, AMM3 Stormwater Pollution Prevention Plan*, *AMM4 Erosion and Sediment Control Plan*, *AMM5 Spill Prevention, Containment, and Countermeasure Plan*, *AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan*, *AMM7 Barge Operations Plan*, and *AMM19 California Clapper Rail and California Black Rail*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas. The AMMs are described in detail in BDCP Appendix 3.C.

Late Long-Term Timeframe

Based on modeled habitat, the study area supports approximately 4,030 acres of primary and 23,458 acres of secondary habitat for California black rail. Alternative 4 as a whole would result in the permanent loss of and temporary effects to 71 acres of primary habitat and to 3,538 acres of secondary habitat for California black rail during the term of the Plan (2% of the total primary habitat in the study area and 15% of the total secondary habitat in the study area). The locations of these losses are described above in the analyses of individual conservation measures. The Plan includes a commitment to restore or create at least 16,900 acres of tidal freshwater and tidal brackish emergent wetlands for California black rail in the study area (Table 12-4-25). The tidal freshwater emergent restoration actions would occur in CZ 1, CZ 2, CZ 4, CZ 5, CZ 6, and/or CZ 7. The tidal brackish emergent restoration actions would occur in CZ 11.

The loss of California black rail habitat associated with Alternative 4 as a whole would represent an adverse effect as a result of habitat modification of a special-status species and potential for direct mortality in the absence of other conservation actions. However, with habitat protection and restoration associated with CM4, guided by biological goals and objectives and AMM1, AMM2, AMM5, and AMM19, which would be in place throughout the time period any construction activity would be occurring, the effects of Alternative 4 as a whole on California black rail would not be adverse under NEPA.

CEQA Conclusion:

Near-Term Timeframe

Because the water conveyance facilities construction (CM1) is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection and/or restoration in an appropriate timeframe to ensure that the effects of construction would be less than significant. The loss of 4 acres of modeled habitat from CM1 involves losses of 1 acre of primary habitat and 3 acres of secondary habitat for California black rail. Typical NEPA and CEQA project-level mitigation ratios for those natural communities affected by CM1 and that are identified in the biological goals and objectives for California black rail in Chapter 3 of the BDCP would be 1:1 for restoration/creation of tidal freshwater and tidal brackish emergent habitat. Using these typical ratios would indicate that 4 acres of tidal natural communities should be restored/created to mitigate for the CM1 losses of California black rail. There would be no offsetting acreage required if the east-west transmission line alignment was selected for Alternative 4. The near-term effects of other conservation actions would remove 1,290 acres of tidal natural communities, and therefore require 1,290 acres of tidal natural communities restoration using the same typical NEPA and CEQA ratios (1:1 for restoration and 2:1 for protection).

The BDCP has committed to near-term goals of restoring 6,200 acres of tidal freshwater emergent and tidal brackish emergent wetlands in the study area. These conservation actions would occur in the same timeframe as the construction and early restoration losses, thereby avoiding adverse effects on California black rail. To ensure that this natural community conservation benefits the species, the Plan's biological goals and objectives (BDCP Chapter 3) further specify that within the 55,000 acres of restored, tidally influenced natural communities, in the late long-term, at least 3,000 acres of tidal brackish emergent wetland would be restored in CZ 11 among the Western Suisun/Hill Slough Marsh Complex, the Suisun Slough/Cutoff Slough Marsh Complex, and the Nurse Slough/Denverton Marsh complex as consistent with the final tidal marsh recovery plan. Of those 3,000 acres of tidal brackish emergent wetland, at least 1,500 acres of high and mid marsh would be distributed in CZ 11, In addition, within the late long-term goal of restoring at least 55,000 acres of tidally influenced natural communities, at least 13,900 acres of tidal freshwater emergent wetland in CZ 1, CZ 2, CZ 4, CZ 5, CZ 6, and/or CZ 7. In addition, tidal freshwater emergent wetlands would be restored in areas that increase connectivity among protected lands. These biological goals and objectives would inform the near-term restoration efforts.

The natural community restoration activities would be concluded in the first 10 years of Plan implementation, which is close enough in time to the occurrence of impacts to constitute adequate mitigation for CEQA purposes. The 16,900 acres of restoration contained in the near-term Plan goals and the additional species specific measures within CM4 are more than sufficient to support the conclusion that the near-term effects of habitat loss and direct mortality under Alternative 4 would be less than significant under CEQA, as AMM1–AMM7 and *AMM19 California Clapper Rail and California Black Rail* would avoid and minimize potential impacts on the species from construction-related habitat loss and noise and disturbance and the number of acres required to meet the typical ratios described above would be only 3,608 acres of restored/created tidal natural communities.

Late Long-Term Timeframe

The permanent and temporary habitat loss from CM1–CM18 in the late long-term timeframe would be 71 acres of primary habitat and to 3,538 acres of secondary habitat for California black rail; this represents 2% and 15% of the primary and secondary modeled habitat, respectively, in the study area. The Plan's *CM4 Tidal Natural Communities Restoration* includes a commitment to restore or create at least 16,900 acres of tidal freshwater and tidal brackish emergent wetlands for California black rail in the study area (Table 12-4-25). The tidal freshwater emergent restoration actions would occur in CZ 1, CZ 2, CZ 4, CZ 5, CZ 6, and/or CZ 7. The tidal brackish emergent restoration actions would occur in CZ 11. The BDCP also includes AMM1–AMM7 and *AMM19 California Clapper Rail and California Black Rail* directed at minimizing or avoiding potential impacts on adjacent habitats during construction and operation of the CMs.

Considering these protection and restoration provisions, which would provide acreages of new or enhanced habitat in amounts greater than necessary to compensate for habitats lost to construction and restoration activities, loss of habitat or direct mortality through implementation of Alternative 4 would not result in a substantial adverse effect through habitat modifications and would not substantially reduce the number or restrict the range of the species. Therefore, the alternative would have a less-than-significant impact on California black rail.

Impact BIO-58: Effects on California black rail associated with electrical transmission facilities

New transmission lines would increase the risk for bird-power line strikes, which could result in injury or mortality of California black rail. The potential for this risk, however, is considered minimal based on the species' low-altitude flight behaviors. Transmission line poles and towers also provide perching structures for raptors, which could result in increased predation pressure on local black rails. Of the proposed permanent and temporary transmission lines, approximately 3 kilometers of lines intersect or occur within 100 meters of modeled black rail habitat, all within Conservation Zones 5 and 6. Little is currently known about the seasonal movements of black rails or the potential for increased predation on rails near power poles. However, transmission facilities are expected to have few adverse effects on the black rail population.

CEQA Conclusion: The construction and presence of new transmission lines would have a less-than-significant impact on California black rail because the risk of bird strike is considered to be minimal based on the species' flight behaviors. Transmission line structures could increase predation on local black rails, by providing perching structures for raptors. However, these impacts on the California black rail population are expected to be less than significant.

Impact BIO-59: Indirect effects of plan implementation on California black rail

Indirect construction-related effects: There are 19 acres of primary habitat and 524 acres of secondary habitat (8% of all existing habitat) within the vicinity of proposed construction areas that could be indirectly affected by construction activities. Indirect effects associated with construction include noise, dust, and visual disturbance caused by grading, filling, contouring, and other ground-disturbing operations outside the project footprint but within 500 feet from the construction edge. The use of mechanical equipment during water conveyance facilities construction could cause the accidental release of petroleum or other contaminants that could affect California black rail in the surrounding habitat. The inadvertent discharge of sediment or excessive dust adjacent to California black rail habitat could also affect the species.

If construction occurs during the nesting season, these indirect effects could result in the loss or abandonment of nests, and mortality of any eggs and/or nestlings. However, there is a commitment in AMM19 (as described in BCDP Appendix 3.C, *Avoidance and Minimization Measures*) that preconstruction surveys of potential breeding habitat would be conducted within 700 feet of project activities, and a 700-foot no-disturbance buffer would be established around any territorial call-centers during the breeding season. In addition, construction would be avoided altogether if breeding territories cannot be accurately delimited.

Preconstruction surveys conducted under *AMM19 California Clapper Rail and California Black Rail* would ensure construction-related noise and visual disturbances would have no adverse effect on California black rail. AMM1–AMM7, including *AMM2 Construction Best Management Practices and Monitoring* would minimize the likelihood of such spills from occurring and ensure measures were in place to prevent runoff from the construction area and to avoid negative effects of dust on the species. Therefore, with the implementation of AMM1–AMM7 and AMM19 in the Plan, there would be no adverse effect on California black rail.

Salinity: Water operations under Operational Scenario A would have an effect on salinity gradients in Suisun Marsh. These effects cannot be disaggregated from tidal habitat restoration, which would also cause changes in salinity gradients. It is expected that the salinity of water in Suisun Marsh would generally increase as a result of water operations and operations of salinity-control gates to mimic a more natural water flow. This would likely encourage the establishment of tidal wetland plant communities tolerant of more brackish environments, which should be beneficial to California black rail because its historical natural Suisun Marsh habitat was brackish tidal marsh.

Methylmercury Exposure: Marsh (tidal and nontidal) and floodplain restoration have the potential to increase exposure to methylmercury. Mercury is transformed into the more bioavailable form of methylmercury in aquatic systems, especially areas subjected to regular wetting and drying such as tidal marshes and flood plains. Thus, BDCP restoration activities that create newly inundated areas could increase bioavailability of mercury (see BDCP Chapter 3, *Conservation Strategy*, for details of restoration). Increased methylmercury associated with natural community and floodplain restoration may indirectly affect California black rail, via uptake in lower tropic levels (as described in the BDCP, Appendix 5.D, *Contaminants*). In general, the highest methylation rates are associated with high tidal marshes that experience intermittent wetting and drying and associated anoxic conditions (Alpers et al. 2008). The potential mobilization or creation of methylmercury within the Plan Area varies with site-specific conditions and would need to be assessed at the project level. Measures described in Chapter 3 of the BDCP, Section 3.4.13, *CM12 Methylmercury Management* include provisions for Project-specific Mercury Management Plans. Along with minimization and mitigation measures and adaptive management and monitoring, CM12 is expected to reduce the effects of methylmercury resulting from BDCP natural communities and floodplain restoration on California black rail.

Concentrations of methylmercury known to cause reproductive effects in birds have been found in blood and feather samples of San Francisco Bay black rails (Tsao et al. 2009). Because they forage directly in contaminated sediments, California black rails may be especially prone to methylmercury contamination. Currently, it is unknown how much of the sediment-derived methylmercury enters the food chain in Suisun Marsh or what tissue concentrations are actually harmful to the California black rail. Although tidal habitat restoration might increase methylation of mercury export to other habitats, it is unlikely to increase the exposure of methylmercury to California black rail, as they currently reside in tidal marshes in the Delta and the San Francisco Bay, where elevated methylmercury levels exist. Sites-specific restoration plans that address the creation and mobilization of mercury, as well as monitoring and adaptive management as described in CM12 would address the uncertainty of methylmercury levels in restored tidal marsh.

CEQA Conclusion: Noise and visual disturbances related to construction-related activities from the CMs could disturb approximately 19 acres of primary and 524 acres of secondary California black rail habitat adjacent to work sites. AMM19 would avoid and minimize impacts on California black rail from noise and visual disturbance. The use of mechanical equipment during water conveyance facilities construction could cause the accidental release of petroleum or other contaminants that could affect California black rail in the surrounding habitat. The inadvertent discharge of sediment or excessive dust adjacent to California black rail habitat could also affect the species. These impacts on California black rail would be less than significant with the incorporation of AMM2 into the BDCP. Implementation of Operational Scenario A, including operation of salinity-control gates, and tidal habitat restoration are expected to increase water salinity in Suisun Marsh. These salinity gradient changes should have a beneficial impact on California black rail through the establishment of tidal marsh similar to historic conditions. Tidal habitat restoration is unlikely to have a significant impact on California black rail through increased exposure to methylmercury, as rails currently reside in tidal marshes where elevated methylmercury levels exist. However, it is unknown what concentrations of methylmercury are harmful to the species. Site-specific restoration plans in addition to monitoring and adaptive management, described in CM12 *Methylmercury Management,* would address the uncertainty of methylmercury levels in restored tidal marsh.

Impact BIO-60: Fragmentation of California black rail habitat as a result of conservation component implementation

Restoration activities may temporarily fragment existing wetlands in Suisun Marsh and could create temporary barriers to California black rail movements. Grading, filling, contouring and other initial ground-disturbing activities could remove habitat along movement corridors used by individuals and potentially reduce access to adjacent habitat areas temporarily. The temporary adverse effects of fragmentation of tidal brackish emergent wetland habitat for California black rail or restoration activities resulting in barriers to movement would be minimized through sequencing of restoration activities. In addition, *AMM19 California Clapper Rail and California Black Rail* would avoid and minimize effects on California black rail. There would be no adverse effect on the species.

CEQA Conclusion: Restoration activities may temporarily fragment existing wetlands in Suisun Marsh and could create temporary barriers to California black rail movements. Fragmentation of California black rail habitat would have a less-than-significant impact on the species because of the sequencing of restoration activities. In addition, AMM19 would avoid and minimize impacts on California black rail, resulting in a less-than-significant impact on the species.

Impact BIO-61: Periodic effects of inundation of California black rail habitat as a result of implementation of conservation components

Flooding of the Yolo Bypass from *CM2 Yolo Bypass Fisheries Enhancement* would not result in the periodic inundation of modeled habitat for California black rail. There are no records for California black rails in the Yolo Bypass, although the species is highly secretive and the extent to which the area has been surveyed for California black rails is unknown. There is potential for the species to occur in the Yolo Bypass after restoration activities are completed. However, if periodic inundation were to occur it would not result in permanent habitat loss and would not prevent use of the bypass by future rail populations. If flooding extended into the breeding season and rails were present, it would preclude nesting in inundated habitats and could result in the loss of nests. Floodplain restoration in CZ 7 as a result of *CM5 Seasonally Inundated Floodplain Restoration* would not likely affect California black rails as the known range and the modeled habitat for the species do not overlap with the hypothetical footprint for this activity. The risk of changes in inundation frequency and duration through CM2 and CM5 affecting California black rail are considered to be low, and would not be expected to result in adverse effects on the species.

CEQA Conclusion: Flooding of the Yolo Bypass under *CM2 Yolo Bypass Fisheries Enhancement* would not result in the periodic inundation of modeled habitat for California black rail. There are no records for California black rails in the Yolo Bypass, although the species is highly secretive and extent to which the area has been surveyed for California black rails is unknown. There is potential for the species to occur in the Yolo Bypass. However, if periodic inundation were to occur it would not result in permanent habitat loss and would not prevent use of the bypass by future rail populations. If flooding extended into the breeding season and rails were present, it would preclude nesting in inundated habitats and could result in the loss of nests. Floodplain restoration in CZ 7 under CM5 would not likely affect California black rails because the known range and the modeled habitat for the species do not overlap with the hypothetical footprint for this activity. The risk of changes in inundation frequency and duration through CM2 and CM5 affecting California black rail are considered to be low, and would be expected to have a less-than-significant impact on the species.

California Clapper Rail

California clapper rail habitat includes primarily middle marsh habitat with select emergent wetland plant alliances. High marsh is also used if it is of high value, and low marsh provides foraging habitat for the species. California clapper rail secondary habitats generally provide only a few ecological functions such as foraging (low marsh) or high-tide refuge (upland transition zones), while primary habitats provide multiple functions including breeding, effective predator cover, and foraging opportunities. Further details regarding the habitat model, including assumptions on which the model is based, are provided in Appendix 2.A, *Covered Species Accounts*.

Construction and restoration associated with Alternative 4 conservation measures would result in both temporary and permanent losses of California clapper rail modeled habitat as indicated in Table 12-4-26. The majority of the losses would take place over an extended period of time as tidal marsh is restored in the study area. Full implementation of Alternative 4 would restore or create 3,000 acres of habitat for the California clapper rail (Table 12-4-26). As explained below, with the restoration or protection of these amounts of habitat, impacts on the California clapper rail would not be adverse for NEPA purposes and would be less than significant for CEQA purposes.

Table 12-4-26. Changes in California Clapper Rail Modeled Habitat Associated with Alternative 4 (acres)[a]

	Conservation Measure[b]	Habitat Type	Permanent		Temporary		Periodic[d]	
			NT	LLT	NT	LLT	Yolo	Floodplain
Habitat Affected[c]	CM1	Primary	0	0	0	0	NA	NA
		Secondary	0	0	0	0	NA	NA
	Total Impacts CM1		**0**	**0**	**0**	**0**		
	CM2–CM18	Primary	25	27	NA	NA	0	0
		Secondary	7	7	NA	NA	0	0
	Total Impacts CM2–CM18		**32**	**34**			**0**	**0**
	TOTAL IMPACTS		**32**	**34**	**X**		**0**	**0**
Habitat Restored/ Created[e]	CM4 tidal restoration		1,000	3,000	NA	NA	NA	NA
	Total Restoration/Creation		**1,000**	**3,000**				
Habitat Protected[e]	**Total Protection**		NA	NA	NA	NA	NA	NA

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late long-term timeframes.
[b] See discussion below for a description of applicable CMs.
[c] LLT acreages are a summation of effects that would occur in the near-term, early long-term and late long-term timeframes. The LLT acreages represent the total amount of habitat that would be affected over the 50-year life of the BDCP and do not reflect habitat increases that would result from restoration, creation and protection activities.
[d] Periodic effects were estimated for the late long-term only. Yolo periodic impacts are presented as a range based on different flow regimes at the proposed notch in Fremont Weir.
[e] Restored/created and protected habitat acreages represent planned conservation activities that would be implemented over the lifetime of the BDCP (See BDCP Chapter 3, *Conservation Strategy,* for specifics).

NT = near-term
LLT = late long-term
NA = not applicable

Impact BIO-62: Loss or conversion of habitat for and direct mortality of California clapper rail

Alternative 4 conservation measures would result in the total loss of up to 27 acres of modeled primary habitat and up to 7 acres of modeled secondary habitat for California clapper rail (Table 12-4-26). The conservation measure that would result in these losses is tidal natural communities restoration (CM4). Habitat enhancement and management activities (CM11), which include ground disturbance or removal of nonnative vegetation, could also result in local adverse habitat effects.

Each of these individual activities is described below. A summary statement of the combined impacts and NEPA and CEQA conclusions follows the individual conservation measure discussions.

- *CM4 Tidal Natural Communities Restoration*: Site preparation and inundation would convert approximately 34 acres of modeled California clapper rail habitat, primarily in CZ 11. The tidal marsh restoration action would not result in the permanent loss of any California clapper rail habitat in the Plan Area. However, approximately 27 acres of primary habitat would be converted to secondary low marsh habitat and 7 acres of secondary habitat would be converted to middle or high marsh. Full implementation of CM4 would restore or create at least 3,000 acres of tidal brackish emergent wetland natural community in CZ 11. Tidal wetlands would be restored as a mosaic of large, interconnected, and biologically diverse patches that supported a natural gradient extending from subtidal to the upland fringe. Much of the restored tidal brackish emergent wetland would meet the primary habitat requirements of the California clapper rail, including development of mid- and high-marsh vegetation with dense, tall stands of pickleweed cover. Restoration would be sequenced and spaced in a manner that minimizes any temporary, initial loss of habitat and habitat fragmentation.
- *CM11 Natural Communities Enhancement and Management*: Because the entire California clapper rail population is restricted to the San Francisco Bay Area estuary, BDCP enhancement and restoration actions would be expected to benefit the species by creating the potential for extending its abundance and distribution in Suisun Marsh. Occupied California clapper rail habitat would be monitored to determine if there is a need for predator control actions. If implemented, nonnative predators would be controlled as needed to reduce nest predation and to help maintain species abundance. A variety of habitat management actions included in *CM11 Natural Communities Enhancement and Management* that are designed to enhance wildlife values in restored and protected tidal wetland habitats could result in localized ground disturbances that could temporarily remove small amounts of California clapper rail habitat. Ground-disturbing activities, such as removal of nonnative vegetation and road and other infrastructure maintenance activities, would be expected to have minor adverse effects on available California clapper rail habitat but to result in overall improvements and maintenance of California clapper rail habitat values over the term of the BDCP.
- Operations and Maintenance: Postconstruction operation and maintenance of the restoration infrastructure could result in ongoing but periodic disturbances that could affect California clapper rail use of the surrounding habitat in Suisun. Maintenance activities could include vegetation management, and levee repair. These effects, however, would be reduced by AMMs and conservation actions as described below.
- Injury and Direct Mortality: Construction vehicle activity may cause injury or mortality to California black rail. If rails are present adjacent to covered activities, the operation of equipment for land clearing, and habitat restoration, enhancement, and management could result in injury or mortality of California clapper rail. Operation of construction equipment could result in injury or mortality of California clapper rails. Risk would be greatest to eggs and nestlings susceptible to land clearing activities, nest abandonment, or increased exposure to the elements or to predators. Injury to adults and fledged juveniles is less likely as these individuals are expected to avoid contact with construction equipment. However, nest sites would be avoided during the nesting season as described in *AMM19 California Clapper Rail and California Black Rail.*

The following paragraphs summarize the combined effects discussed above and describe other BDCP conservation actions that offset or avoid these effects. NEPA and CEQA impact conclusions are also included.

Near-Term Timeframe

Under Alternative 4, there would be no impacts resulting from the construction of the water conveyance facilities (CM1) with either the east-west alignment or the north-south alignment. However, there would be a loss of 32 acres of modeled habitat for California clapper rail in the study area in the near-term. These effects would result from implementing CM4 tidal restoration (25 acres of primary and 7 acres of secondary habitat). The typical NEPA and CEQA project-level mitigation ratio for those natural communities affected by CM4 and that are identified in the biological goals and objectives for California clapper rail in Chapter 3 of the BDCP would be 1:1 for restoration/creation of tidal brackish emergent habitat. Using this ratio would indicate that 32 acres of tidal brackish emergent wetland should be restored/created to mitigate for the CM4 losses of California clapper rail.

The BDCP has committed to near-term goals of restoring 1,000 acres of tidal brackish emergent wetlands in the study area. These conservation actions would occur in the same timeframe as the early restoration losses, thereby avoiding adverse effects on California clapper rail. To ensure that this natural community conservation benefits the species, the Plan's biological goals and objectives (BDCP Chapter 3, *Conservation Strategy*) further specify that within the 55,000 acres of restored, tidally influenced natural communities, in the late long-term, at least 3,000 acres of tidal brackish emergent wetland would be restored in CZ 11 among the Western Suisun/Hill Slough Marsh Complex, the Suisun Slough/Cutoff Slough Marsh Complex, and the Nurse Slough/Denverton Marsh complex as consistent with the final tidal marsh recovery plan. Of those 3,000 acres of tidal brackish emergent wetland, at least 1,500 acres of high and mid marsh would be distributed in CZ 11, which would provide primary habitat for the California clapper rail. These biological goals and objectives would inform the near-term restoration efforts and represent performance standards for considering the effectiveness of restoration actions. The acres of restoration contained in the near-term Plan goals and the additional species specific measures within CM4 more than satisfy the typical mitigation that would be applied to the near-term effects of tidal restoration.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training*, *AMM2 Construction Best Management Practices and Monitoring, AMM3 Stormwater Pollution Prevention Plan*, *AMM4 Erosion and Sediment Control Plan*, *AMM5 Spill Prevention, Containment, and Countermeasure Plan*, *AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan*, *AMM7 Barge Operations Plan*, and *AMM19 California Clapper Rail and California Black Rail*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas. The AMMs are described in detail in BDCP Appendix 3.C.

Late Long-Term Timeframe

Based on modeled habitat, the study area supports approximately 306 acres of primary and 6,457 acres of secondary habitat for California clapper rail. Alternative 4 as a whole would result in the permanent loss of and temporary effects to 27 acres of primary habitat and to 7 acres of secondary habitat for California clapper rail during the term of the Plan (9% of the total primary habitat in the study area and less than 1% of the total secondary habitat in the study area). The locations of these losses are described above in the analyses of individual conservation measures. The Plan includes a commitment to restore or create at least 3,000 acres of tidal brackish emergent wetlands for California clapper rail in the study area in Suisun Marsh in CZ 11 (Table 12-4-26).

The loss of California clapper rail habitat associated with Alternative 4 would represent an adverse effect as a result of habitat modification of a special-status species and potential for direct mortality in the absence of other conservation actions. However, with habitat protection and restoration associated with CM4, guided by biological goals and objectives and AMM1–AMM7 and AMM19, which would be in place throughout the construction time period, the effects of Alternative 4 as a whole on California clapper rail would not be adverse under NEPA.

CEQA Conclusion: Alternative 4 (CM4) would have both temporary and permanent impacts on California clapper rail and its modeled habitat and operation of construction equipment could injure or disturb rails.

Near-Term Timeframe

Under Alternative 4, there would be no impacts resulting from the construction of the water conveyance facilities (CM1) with either the east-west alignment or the north-south alignment. However, there would be a loss of 32 acres of modeled habitat for California clapper rail in the study area in the near-term. These effects would result from implementing CM4 tidal restoration (25 acres of primary and 7 acres of secondary habitat). The typical NEPA and CEQA project-level mitigation ratio for those natural communities affected by CM4 and that are identified in the biological goals and objectives for California clapper rail in Chapter 3 of the BDCP would be 1:1 for restoration/creation of tidal brackish emergent habitat. Using this ratio would indicate that 32 acres of tidal brackish emergent wetland should be restored/created to mitigate for the CM4 losses of California clapper rail.

The BDCP has committed to near-term goals of restoring 1,000 acres of tidal brackish emergent wetlands in the study area. These conservation actions would occur in the same timeframe as the early restoration losses, thereby avoiding adverse effects on California clapper rail. To ensure that this natural community conservation benefits the species, the Plan's biological goals and objectives (BDCP Chapter 3, *Conservation Strategy*) further specify that within the 55,000 acres of restored, tidally influenced natural communities, in the late long-term, at least 3,000 acres of tidal brackish emergent wetland would be restored in CZ 11 among the Western Suisun/Hill Slough Marsh Complex, the Suisun Slough/Cutoff Slough Marsh Complex, and the Nurse Slough/Denverton Marsh complex as consistent with the final tidal marsh recovery plan. Of those 3,000 acres of tidal brackish emergent wetland, at least 1,500 acres of high and mid marsh would be distributed in CZ 11, which would provide primary habitat for the California clapper rail. These biological goals and objectives would inform the near-term restoration efforts and represent performance standards for considering the effectiveness of restoration actions.

The natural community restoration activities would be concluded in the first 10 years of Plan implementation, which is close enough in time to the occurrence of restoration impacts to constitute adequate mitigation for CEQA purposes. The 1,000 acres of restoration contained in the near-term Plan goals and the additional direction in the biological goals and objectives are more than sufficient to support the conclusion that the near-term effects of habitat loss and direct mortality under Alternative 4 would be less than significant under CEQA, as AMM1–AMM7 and AMM19 would avoid and minimize potential impacts on the species from construction-related habitat loss and noise and disturbance and the number of acres required to meet the typical ratios described above would be only 32 acres of restored/created tidal brackish natural communities.

Late Long-Term Timeframe

The permanent and temporary habitat loss from CM4 in the late long-term timeframe would be 27 acres of primary habitat and 7 acres of secondary habitat for California clapper rail; this represents 9% and less than 1% of the primary and secondary modeled habitat, respectively, in the study area. The Plan's *CM4 Tidal Natural Communities Restoration* includes a commitment to restore or create at least 3,000 acres of tidal brackish emergent wetlands for California clapper rail in the study area in Suisun Marsh in CZ 11 (Table 12-4-26). The BDCP also includes a number of AMMs (AMM1–AMM7 and AMM19) directed at minimizing or avoiding potential impacts on adjacent habitats during construction and operation of the conservation measures.

Considering these protection and restoration provisions, which would provide acreages of new or enhanced habitat in amounts greater than necessary to compensate for habitats lost to construction and restoration activities, loss of habitat or direct mortality through implementation of Alternative 4 would not result in a substantial adverse effect through habitat modifications and would not substantially reduce the number or restrict the range of the species. Therefore, the alternative would have a less-than-significant impact on California clapper rail.

Impact BIO-63: Indirect effects of plan implementation on California clapper rail

Indirect construction-related effects: There are approximately 542 acres of California clapper rail habitat within the vicinity of proposed restoration areas that could be indirectly affected by construction activities. Indirect effects associated with construction include noise, dust, and visual disturbance caused by grading, filling, contouring, and other ground-disturbing operations outside the project footprint but within 500 feet from the construction edge. The use of mechanical equipment during construction-related restoration activities could cause the accidental release of petroleum or other contaminants that could affect California black rail in the surrounding habitat. The inadvertent discharge of sediment or excessive dust adjacent to California clapper habitat could also affect the species. If construction occurs during the nesting season, these indirect effects could result in the loss or abandonment of nests, and mortality of any eggs and/or nestlings. However, there is a commitment in AMM19 (as described in BDCP Appendix 3.C, *Avoidance and Minimization Measures*) that preconstruction surveys of potential breeding habitat would be conducted within 700 feet of project activities, and a 700-foot no-disturbance buffer would be established around any territorial call-centers during the breeding season. In addition, construction would be avoided altogether if breeding territories cannot be accurately delimited.

Preconstruction surveys conducted under *AMM19 California Clapper Rail and California Black Rail* would ensure construction-related noise and visual disturbances would have no adverse effect on California black rail. AMM1–AMM7, including *AMM2 Construction Best Management Practices and Monitoring*, would minimize the likelihood of such spills from occurring and ensure measures were in place to prevent runoff from the construction area and to avoid negative effects of dust on the species. Therefore, with the implementation of AMM1–AMM7 and AMM19 in the Plan, there would be no adverse effect on California black rail.

Salinity: Water operations under Operational Scenario A would have an effect on salinity gradients in Suisun Marsh. These effects cannot be disaggregated from tidal habitat restoration, which would also cause changes in salinity gradients. It is expected that the salinity of water in Suisun Marsh would generally increase as a result of water operations and operations of salinity-control gates to mimic a more natural water flow. This would likely encourage the establishment of tidal wetland plant communities tolerant of more brackish environments, which would be beneficial to California clapper rail because its historical natural Suisun Marsh habitat was brackish tidal marsh.

Methylmercury Exposure: Marsh (tidal and nontidal) and floodplain restoration also have the potential to increase exposure to methylmercury. Mercury is transformed into the more bioavailable form of methylmercury in aquatic systems, especially areas subjected to regular wetting and drying such as tidal marshes and flood plains. Thus, BDCP restoration activities that create newly inundated areas could increase bioavailability of mercury (see BDCP Chapter 3, *Conservation Strategy*, for details of restoration). Concentrations of methylmercury known to be toxic to bird embryos have been found in the eggs of San Francisco Bay clapper rails (Schwarzbach and Adelsbach 2003). In general, the highest methylation rates are associated with high tidal marshes that experience intermittent wetting and drying and associated anoxic conditions (Alpers et al. 2008). Currently, it is unknown how much of the sediment-derived methylmercury enters the food chain in Suisun Marsh or what tissue concentrations are actually harmful to the California clapper rail. However, although tidal habitat restoration might increase methylation of mercury export to other habitats, it is unlikely to significantly increase the exposure of methylmercury to California clapper rails, as they currently reside in tidal marshes where elevated methylmercury levels exist. *CM12 Methylmercury Management* includes project-specific management plans including monitoring and adaptive management to address the uncertainty of methylmercury levels in restored tidal marsh.

CEQA Conclusion: Noise and visual disturbances related to construction-related activities from the CMs could disturb approximately 542 acres of California clapper rail habitat adjacent to work sites. AMM19 would avoid and minimize impacts on California clapper rail from noise and visual disturbance. The use of mechanical equipment during water conveyance facilities construction could cause the accidental release of petroleum or other contaminants that could affect California clapper rail in the surrounding habitat. The inadvertent discharge of sediment or excessive dust adjacent to California clapper rail habitat could also affect the species. These impacts on California clapper rail would be less than significant with the incorporation of AMM1–AMM7 into the BDCP. Implementation of Operational Scenario A, including operation of salinity-control gates, and tidal habitat restoration are expected to increase water salinity in Suisun Marsh. These salinity gradient changes should have a beneficial impact on California clapper rail through the establishment of tidal marsh similar to historic conditions. Although tidal habitat restoration might increase methylation of mercury export to other habitats, it is unlikely to significantly increase the exposure of methylmercury to California clapper rail, as they currently reside in tidal marshes in the San Francisco Bay, where elevated methylmercury levels exist. It is unknown what concentrations of methylmercury are harmful to the species. *CM12 Methylmercury Management* includes project-specific management plans including monitoring and adaptive management to address the uncertainty of methylmercury levels in restored tidal marsh.

Impact BIO-64: Effects on California clapper rail associated with electrical transmission facilities

Isolated patches of suitable California clapper rail habitat may occur in the Plan Area as far east as (but not including) Sherman Island. Home range and territory of the California clapper rail is not known, but in locations outside of California, clapper rail territory ranges 0.3 acre to 8 acres (0.1 to 3.2 hectares) (Rush et al. 2012), indicating that known occurrences are not likely to intersect with the proposed lines (BDCP Attachment 5.J-2*, Memorandum: Analysis of Potential Bird Collisions at Proposed BDCP Transmission Lines*). The location of the current population and suitable habitat for the species make collision with the proposed transmission lines highly unlikely; therefore, the construction and presence of new transmission lines would not have an adverse effect on California clapper rail.

CEQA Conclusion: The construction and presence of new transmission lines would have a less-than-significant impact on California clapper rail because the location of the current population and suitable habitat for the species make collision with the proposed transmission lines highly unlikely.

Impact BIO-65: Fragmentation of California clapper rail habitat as a result of construction of conservation components

Restoration activities may temporarily fragment existing wetlands in Suisun Marsh and could create temporary barriers to movements of California clapper rail. Grading, filling, contouring and other initial ground-disturbing activities could remove habitat along movement corridors used by individuals and, thus, temporarily reduce access to adjacent habitat areas. The temporary adverse effects of fragmentation of tidal brackish emergent wetland habitat for California clapper rail or restoration activities resulting in barriers to movement would be minimized through sequencing of restoration activities to minimize effects of temporary habitat loss. In addition, *AMM19 California Clapper Rail and California Black Rail* would avoid and minimize effects on California clapper rail. Therefore, California clapper rail habitat fragmentation would not have an adverse effect on the species.

CEQA Conclusion: Restoration activities may temporarily fragment existing wetlands in Suisun Marsh and could create temporary barriers to movements of California clapper rail. Fragmentation of California clapper rail habitat would have a less-than-significant impact on the species because of the sequencing of restoration activities. In addition, AMM19 would avoid and minimize impacts on California Clapper Rail.

California Least Tern

California least tern modeled habitat identifies foraging habitat as all tidal perennial aquatic natural community in the study area. Breeding habitat is not included in the model because most of the natural shoreline in the study area that historically provided nesting sites has been modified or removed.

Construction and restoration associated with Alternative 4 conservation measures would result in both temporary and permanent losses of California least tern modeled habitat as indicated in Table 12-4-27. Full implementation of Alternative 4 would restore or create 10,000 acres of foraging habitat for the California least tern (Table 12-4-27). As explained below, with the restoration or protection of these amounts of habitat, impacts on the California least tern would not be adverse for NEPA purposes and would be less than significant for CEQA purposes.

Table 12-4-27. Changes in California Least Tern Modeled Habitat Associated with Alternative 4 (acres)[a]

	Conservation Measure[b]	Habitat Type	Permanent		Temporary		Periodic[d]	
			NT	LLT	NT	LLT	Yolo	Floodplain
Habitat Affected[c]	CM1	Foraging	41	41	108	108	NA	NA
	Total Impacts CM1		**41**	**41**	**108**	**108**		
	CM2–CM18	Foraging	22	28	12	17	0	39
	Total Impacts CM2–CM18		**22**	**28**	**12**	**17**	**0**	**39**
	TOTAL IMPACTS		**63**	**69**	**120**	**125**	**0**	**39**

Habitat Restored/ Created[e] CM4 tidal perennial aquatic	2,500	10,000		NA N A		NA N A	
	Total Restoration/ Creation	**2,500**	**10,000**				
Habitat Protected[e]	**Total Protection**	NA	NA	NA	NA	NA	NA

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late long-term timeframes.

[b] See discussion below for a description of applicable CMs.

[c] LLT acreages are a summation of effects that would occur in the near-term, early long-term and late long-term timeframes. The LLT acreages represent the total amount of habitat that would be affected over the 50-year life of the BDCP and do not reflect habitat increases that would result from restoration, creation and protection activities.

[d] Periodic effects were estimated for the late long-term only. Yolo periodic impacts are presented as a range based on different flow regimes at the proposed notch in Fremont Weir.

[e] Restored/created and protected habitat acreages represent planned conservation activities that would be implemented over the lifetime of the BDCP (See BDCP Chapter 3 *Conservation Strategy* for specifics).

NT = near-term

LLT = late long-term

NA = not applicable

Impact BIO-66: Loss or conversion of habitat for and direct mortality of California least tern

Alternative 4 conservation measures would result in the combined permanent and temporary loss of up to 194 acres of modeled foraging habitat for California least tern (Table 12-4-27). The conservation measures that would result in these losses are construction of water conveyance facilities and operation (CM1), Yolo Bypass Fisheries Enhancement (CM2), Tidal Natural Communities Restoration (CM4), and Seasonally Inundated Floodplain Restoration (CM5). Habitat enhancement and management activities (CM11), which include ground disturbance or removal of nonnative vegetation, could also result in local adverse habitat effects. In addition, maintenance activities associated with the long-term operation of the water conveyance facilities and other BDCP physical facilities could degrade or eliminate California least tern foraging habitat. Each of these individual activities is described below. A summary statement of the combined impacts and NEPA and CEQA conclusions follows the individual conservation measure discussions.

- *CM1 Water Facilities and Operation:* Construction of Alternative 4 conveyance facilities would result in the combined permanent and temporary loss of up to 149 acres of modeled California least tern aquatic foraging habitat (Table 12-4-27). Of the 149 acres of modeled habitat that would be removed for the construction of the conveyance facilities, 108 acres would be a temporary loss. Most of the permanent loss would occur where Intakes 2, 3 and 5 encroach on the Sacramento River's east bank between Clarksburg and Courtland. The temporary effects on tidal perennial aquatic habitats would occur at numerous locations, including in the Sacramento River at Intakes 2, 3, and 5, and at temporary barge unloading facilities established at five locations along the tunnel route. Refer to the Terrestrial Biology Map Book for a detailed view of Alternative 4 construction locations.

  There would be a 12 acre decrease in permanent and temporary losses of California least tern habitat with the construction of the east-west transmission line alignment rather than the north-south alignment. However, the actual footprint of the transmission towers and related facilities for either the east-west or the north-south alignment would not be likely to be constructed in aquatic environments.

- *CM2 Yolo Bypass Fisheries Enhancement:* Construction of Yolo Bypass fisheries enhancement (CM2) would result in the permanent loss of 8 acres and the temporary loss of 12 acres of modeled aquatic foraging habitat for California least tern in CZ 2. Activities from Fremont and Sacramento Weir improvements, Putah Creek realignment, and Lisbon Weir modification could involve excavation and grading in tidal perennial aquatic areas to improve passage of fish through the bypasses.
- *CM4 Tidal Natural Communities Restoration:* Tidal habitat restoration actions would result in the permanent loss of 18 acres of modeled aquatic foraging habitat for California least tern. reduce the tidal prism, causing desiccation of aquatic areas lying at the upper edge of the tidal prism. As described in the BDCP, the restoration of 10,000 acres of tidal perennial aquatic habitat would support aquatic food production and foraging habitat for the California least tern. Tidal perennial aquatic restoration would be expected to substantially increase the primary productivity of fish, increasing the prey base for California least terns.
- *CM5 Seasonally Inundated Floodplain Restoration:* Construction of setback levees to restore seasonally inundated floodplain (CM5) would result in the permanent loss of 2 acres and the temporary loss of 5 acres of modeled aquatic foraging habitat for California least tern.
- *CM11 Natural Communities Enhancement and Management:* A variety of habitat management actions contained in *CM11 Natural Communities Enhancement and Management* that are designed to enhance wildlife values in restored and protected tidal wetland habitats may result in localized ground disturbances that could result in local adverse habitat effects and injury or mortality of California least terns. Noise and visual disturbances during implementation of habitat management actions could also result in temporary disturbances that affect California least tern use of the surrounding habitat. These effects cannot be quantified, but are expected to be minimal because few management activities would be implemented in aquatic habitat and because terns are not expected to nest on protected lands. Surveys would be conducted prior to ground disturbance in any areas that have suitable nesting substrate for California least tern (flat, unvegetated areas near aquatic foraging habitat) and injury mortality and noise and visual disturbance of nesting terns would be avoided and minimized by the AMMs listed below.
- Operations and Maintenance: Postconstruction operation and maintenance of the above-ground water conveyance facilities and restoration infrastructure could result in ongoing but periodic post construction disturbances, localized impacts on California least tern foraging habitat, and temporary noise and disturbances over the term of the BDCP. Maintenance activities would include vegetation management, levee and structure repair, and re-grading of roads and permanent work areas. These effects, however, would be reduced by AMMs and conservation actions as described below.
- Injury and Direct Mortality: California least terns currently nest in the vicinity of potential restoration sites in Suisun Marsh and west Delta area (CZ 10 and CZ 11). New nesting colonies could establish if suitable nesting habitat is created during restoration activities (e.g., placement of unvegetated fill to raise surface elevations prior to breaching levees during restoration efforts). If nesting occurs where covered activities are undertaken, the operation of equipment for land clearing, construction, conveyance facilities operation and maintenance, and habitat restoration, enhancement, and management could result in injury or mortality of California least tern. Risk of injury or disturbance would be greatest to eggs and nestlings susceptible to land-

clearing activities, abandonment of nests and nesting colonies, or increased exposure to the elements or to predators. Injury to adults or fledged juveniles is less likely as these individuals would be expected to avoid contact with construction equipment. However, injury or mortality would be avoided through planning and preconstruction surveys to identify nesting colonies, the design of projects to avoid locations with least tern colonies, and the provision for 500-foot buffers as required by AMMs listed below.

The following paragraph summarizes the combined effects discussed above and describe other BDCP conservation actions that offset or avoid these effects. NEPA and CEQA impact conclusions are also included.

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection and/or restoration in an appropriate timeframe to ensure that the effects of construction would not be adverse under NEPA and would be less than significant under CEQA. With Plan implementation, there would be a loss of 183 acres of modeled foraging habitat for California least tern in the study area in the near-term. These effects would result from the construction of the water conveyance facilities (CM1, 149 acres), and implementing other conservation measures (Yolo Bypass fisheries improvements [CM2], tidal restoration [CM4], floodplain restoration [CM5], 34 acres). All modeled foraging habitat impacts would occur in tidal perennial aquatic natural communities

Typical NEPA and CEQA project-level mitigation ratios for those natural communities affected by CM1 and that are identified in the biological goals and objectives for California least tern in Chapter 3 of the BDCP would be 1:1 for restoration/creation of tidal perennial aquatic habitat. Using these typical ratios would indicate that 149 acres of the tidal perennial aquatic natural community should be restored/created to mitigate for the CM1 losses of California least tern foraging habitat. The offsetting acreage would only need to be 147 acres if the east-west transmission line alignment was selected for Alternative 4. The near-term effects of other conservation actions would remove 34 acres of tidal perennial aquatic habitat, and therefore require 34 acres of tidal perennial aquatic natural community restoration using the same typical NEPA and CEQA ratios (1:1 for restoration).

The BDCP has committed to near-term goals of restoring 2,500 acres of the tidal perennial aquatic natural community in the study area. These conservation actions would occur in the same timeframe as the construction and early restoration losses, thereby avoiding adverse effects on California least tern. The Plan's biological goals and objectives (BDCP Chapter 3, *Conservation Strategy*) further specify that within the 55,000 acres of restored, tidally influenced natural communities, in the late long-term, at least 10,000 acres of tidal perennial aquatic would be restored/created in CZ 1, 2, 4, 5, 7, and 11 that support aquatic food production and habitat for native species. These biological goals and objectives would inform the near-term restoration efforts and represent performance standards for considering the effectiveness of restoration actions. The acres of restoration contained in the near-term Plan goals satisfy the typical mitigation that would be applied to the project-level effects of CM1, as well as mitigating the near-term effects of the other conservation measures.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training*, *AMM2 Construction Best Management Practices and Monitoring, AMM3 Stormwater Pollution Prevention Plan*, *AMM4 Erosion and Sediment Control Plan*, *AMM5 Spill Prevention, Containment, and Countermeasure Plan*, *AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan*, *AMM7 Barge*

Operations Plan, and *AMM22 California Least Tern*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas. The AMMs are described in detail in BDCP Appendix 3.C.

Late Long-Term Timeframe

Based on modeled habitat, the Plan Area supports approximately 86,266 acres of modeled foraging habitat for California least tern. Alternative 4 as a whole would result in the permanent loss of and temporary effects to 194 acres of California least tern foraging habitat during the term of the Plan (less than 1% of the total foraging habitat in the Plan Area). The locations of these losses are described above in the analyses of individual conservation measures. The Plan includes a commitment to restore or create at least 10,000 acres of tidal perennial aquatic habitat natural community in the study area which would provide foraging habitat for California least tern (Table 12-4-27). The tidal perennial aquatic restoration actions would occur in CZ 1, CZ 2, CZ 4, CZ 5, CZ 7, and CZ 11.

The loss of California least tern habitat associated with Alternative 4 would represent an adverse effect as a result of foraging habitat modification of a special-status species and potential for direct mortality in the absence of other conservation actions. However, with habitat restoration associated with CM4, guided by biological goals and objectives and AMM1–AMM7, and AMM22, which would be in place throughout the time period any construction activity would be occurring, the effects of habitat loss and mortality from Alternative 4 on California least tern would not be adverse under NEPA.

CEQA Conclusion: Alternative 4 (CM1 and CM4) would have both temporary and permanent impacts on California least tern and its modeled habitat and operation of construction equipment could injure or disturb rails.

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection and/or restoration in an appropriate timeframe to ensure that the impacts of construction would be less than significant. With Plan implementation, there would be a loss of 183 acres of modeled foraging habitat for California least tern in the study area in the near-term. These impacts would result from the construction of the water conveyance facilities (CM1, 149 acres), and implementing other conservation measures (Yolo Bypass fisheries improvements [CM2], tidal restoration [CM4], floodplain restoration [CM5], 34 acres). All modeled foraging habitat impacts would occur in tidal perennial aquatic natural communities

The loss of 149 acres of modeled foraging habitat from CM1 involves losses of 41 acres of permanent loss and 108 acres of temporary loss. The typical NEPA and CEQA project-level mitigation ratio for the natural community affected by CM1 and that are identified in the biological goals and objectives for California least tern in Chapter 3 of the BDCP would be 1:1 for restoration/creation of tidal perennial aquatic habitat. Using this ratio would indicate that 181 acres of the tidal perennial aquatic natural community should be restored/created to mitigate for the CM1 losses of California least tern foraging habitat. The offsetting acreage would only need to be 147 acres if the east-west transmission line alignment was selected for Alternative 4. The near-term effects of other conservation actions would remove 34 acres of tidal perennial aquatic habitat, and, therefore, require 34 acres of tidal perennial aquatic natural community restoration using the same typical NEPA and CEQA ratio (1:1 for restoration).

The BDCP has committed to near-term goals of restoring 2,500 acres of the tidal perennial aquatic natural community in the study area. These conservation actions would occur in the same timeframe as the construction and early restoration losses, thereby avoiding adverse effects on California least tern. The Plan's biological goals and objectives (BDCP Chapter 3, *Conservation Strategy*) further specify that within the 55,000 acres of restored, tidally influenced natural communities, in the late long-term, at least 10,000 acres of tidal perennial aquatic would be restored/created in CZ 1, 2, 4, 5, 7, and 11 that support aquatic food production and habitat for native species. These biological goals and objectives would inform the near-term restoration efforts and represent performance standards for considering the effectiveness of restoration actions. The natural community restoration activities would be concluded in the first 10 years of Plan implementation, which is close enough in time to the occurrence of impacts to constitute adequate mitigation for CEQA purposes. The 2,500 acres of restoration contained in the near-term Plan goals and the additional directions for the location of restoration located in the Plan's biological goals and objectives are more than sufficient to support the conclusion that the near-term effects of habitat loss and direct mortality under Alternative 4 would be less than significant under CEQA, as the number of acres required to meet the typical ratios described above would be only 215 acres of restored/created tidal perennial aquatic habitat. In addition, AMM1–AMM7, and AMM22 would avoid and minimize potential impacts on the species from habitat loss and construction-related activities.

Late Long-Term Timeframe

Based on modeled habitat, the Plan Area supports approximately 86,266 acres of modeled foraging habitat for California least tern. Alternative 4 as a whole would result in the permanent loss of and temporary effects on 194 acres of California least tern foraging habitat during the term of the Plan (less than 1% of the total foraging habitat in the Plan Area). The Plan's *CM4 Tidal Natural Communities Restoration* includes a commitment to restore or create at least 10,000 acres of tidal perennial aquatic natural community in the study area which would provide foraging habitat for the California least tern (Table 12-4-27). The tidal perennial aquatic restoration actions would occur in CZ 1, CZ 2, CZ 4, CZ 5, CZ 7, and CZ 11. The BDCP also includes a number of AMMs (AMM1–AMM7 and AMM22) directed at minimizing or avoiding potential impacts on adjacent habitats during construction and operation of the conservation measures.

Considering these protection and restoration provisions, which would provide acreages of new or enhanced habitat in amounts greater than necessary to compensate for habitats lost to construction and restoration activities, loss of habitat or direct mortality through implementation of Alternative 4 would not result in a substantial adverse effect through habitat modifications and would not substantially reduce the number or restrict the range of the species. Therefore, the loss of habitat or mortality under this alternative would have a less-than-significant impact on California least tern.

Impact BIO-67: Indirect effects of plan implementation on California least tern

Indirect construction-related effects: There are 3,600 acres of California least tern foraging habitat (4% of all existing habitat) within the vicinity of proposed construction areas that could be indirectly affected by construction activities. Indirect effects associated with construction include noise, dust, and visual disturbance caused by grading, filling, contouring, and other ground-disturbing operations outside the project footprint but within 500 feet from the construction edge.

The use of mechanical equipment during water conveyance facilities construction could cause the accidental release of petroleum or other contaminants that could affect California least tern or their prey species in the surrounding habitat. The inadvertent discharge of sediment or excessive dust adjacent to foraging habitat could also affect the species. Noise and visual disturbance is not expected to have an adverse effect on California least tern foraging behavior. As described in AMM22, if least tern nests were found during planning or preconstruction surveys, no construction would take place within 500 feet of active nests. In addition, AMM1–AMM7, including construction best management practices, would minimize the likelihood of spills from occurring or excessive dust being created during construction. Should a spill occur, implementation of these AMMs would greatly reduce the likelihood of individuals being affected.

Methylmercury Exposure: Covered activities have the potential to exacerbate the bioaccumulation of mercury in avian species including the California least tern. The operational impacts of new flows under CM1 were analyzed using a DSM-2 based model to assess potential effects on mercury concentration and bioavailability. Subsequently, a regression model was used to estimate fish-tissue concentrations under these future operational conditions (evaluated starting operations or ESO). Results indicated that changes in total mercury levels in water and fish tissues due to ESO were insignificant (see BDCP, Appendix 5.D Tables 5D.4-3, 5D.4-4, and 5D.4-5).

Marsh (tidal and nontidal) and floodplain restoration also have the potential to increase exposure to methylmercury. Mercury is transformed into the more bioavailable form of methylmercury in aquatic systems, especially areas subjected to regular wetting and drying such as tidal marshes and flood plains. Thus, BDCP restoration activities that create newly inundated areas could increase bioavailability of mercury (see BDCP Chapter 3, *Conservation Strategy*, for details of restoration). Increased methylmercury associated with natural community and floodplain restoration may indirectly affect California least tern, via uptake in lower tropic levels (as described in the BDCP, Appendix 5.D, *Contaminants*). In general, the highest methylation rates are associated with high tidal marshes that experience intermittent wetting and drying and associated anoxic conditions (Alpers et al. 2008). The potential mobilization or creation of methylmercury within the Plan Area varies with site-specific conditions and would need to be assessed at the project level.

Schwarzbach and Adelsbach (2003) investigated mercury exposure in 15 species of birds inhabiting the Bay-Delta ecosystem. Among the species studied, the highest concentrations of mercury were found in the eggs of piscivorous birds (terns and cormorants) that bioaccumulate mercury from their fish prey. The very highest concentrations were found in Caspian and Forster's terns, especially those inhabiting South San Francisco Bay. Based on three California least tern eggs collected from Alameda Naval Air Station in the San Francisco Central Bay, concentrations in California least tern eggs were a third (0.3 ppm) those of the eggs of the other two terns. Because of the small sample size, there is a high degree of uncertainty regarding the levels of mercury that may be present in California least tern eggs. If the mercury levels measured at Alameda Naval Air Station are representative of the population in the San Francisco Bay, they would not be expected to result in adverse effects on tern hatchlings. Hatching and fledging success were not reduced in common tern eggs in Germany with mercury concentrations of 6.7 ppm (Hothem and Powell 2000).

CM12 Methylmercury Management includes provisions for project-specific Mercury Management Plans. Site-specific restoration plans that address the creation and mobilization of mercury, as well as monitoring and adaptive management as described in CM12 would be available to address the uncertainty of methylmercury levels in restored tidal marsh and potential impacts on California least tern.

CEQA Conclusion: Noise and visual disturbances within 500 feet of construction-related activities from the CMs could disturb approximately 3,600 acres of California least tern foraging habitat adjacent to work sites. Noise and visual disturbance would have a less-than-significant effect on foraging terns. AMM22 would avoid and minimize impacts on potential nesting California least terns from noise and visual disturbance. The use of mechanical equipment during water conveyance facilities construction could cause the accidental release of petroleum or other contaminants that could affect California least tern if present in the surrounding habitat. The inadvertent discharge of sediment or excessive dust adjacent to California least tern habitat could also affect the species. These impacts on California least tern would be less than significant with the incorporation of AMM1–AMM7 and AMM22 into the BDCP. Tidal habitat restoration could result in increased exposure of California least tern to methylmercury. However, it is unknown what concentrations of methylmercury are harmful to the species. Sites-specific restoration plans that address the creation and mobilization of mercury, as well as monitoring and adaptive management as described in *CM12 Methylmercury Management*, would be available to address the uncertainty of methylmercury levels in restored tidal marsh and potential impacts on California least tern.

Impact BIO-68: Effects on California least tern associated with electrical transmission facilities

New transmission lines would increase the risk for bird-power line strikes, which could result in injury or mortality of California least tern. This risk is considered to be minimal based on tern flight behaviors and its unlikely use of habitats near the transmission line corridors.

CEQA Conclusion: Installation and presence of new transmission lines would not result in significant impacts on California least terns because they are not known to be present in areas of disturbance and because the probability of bird-powerline strikes is unlikely due to tern flight behaviors.

Greater Sandhill Crane

Greater sandhill cranes in the study area are almost entirely dependent on privately owned agricultural lands for foraging. Long-term sustainability of the species is thus dependent on providing a matrix of compatible crop types that afford suitable foraging habitat and maintaining compatible agricultural practices, while sustaining and increasing the extent of other essential habitat elements such as night roosting habitat. The habitat model for greater sandhill crane identified suitable foraging and roosting habitat in the study area as certain agricultural types, specific grassland types, irrigated pastures and hay crops, managed seasonal wetland, and other natural seasonal wetland. Factors included in assessing the value of affected habitat for the greater sandhill crane includes the relative habitat vale of specific crop or land cover types, and proximity to known roost sites. Foraging habitat for greater sandhill crane included suitable habitat up to 4 miles from known roost sites, within the boundary of the winter crane use area (Ivey pers. comm.).

Construction and restoration associated with Alternative 4 conservation measures would result in both temporary and permanent losses of foraging and roosting habitat for greater sandhill crane as indicated in Table 12-4-28. Full implementation of Alternative 4 would restore or create greater sandhill crane roosting habitat consisting of 320 acres of managed wetlands in patch sizes of 40 acres, and 305 acres of active corn fields flooded through harvest. In addition, 14,444 acres of foraging habitat and 645 acres of roosting habitat would be protected (Table 12-4-28). Of the 14,444 acres of protected foraging habitat, at least 5,000 acres will be of high- to very high-value for the greater sandhill crane, with at least 80% maintained in very high-value types in any given year, as defined by the Plan. This protected area will be within 2 miles of known roosting sites in Conservation Zones 3, 4, 5, and/or 6 and will consider sea level rise, greater sandhill crane population levels, and the location of habitat loss. Patch size of cultivated lands will be at least 160 acres. As explained below, with the restoration or protection of these amounts of habitat, in addition to AMMs and mitigation measures described below to minimize potential adverse effects, impacts on greater sandhill crane would not be adverse for NEPA purposes and would be less than significant for CEQA purposes.

Table 12-4-28. Changes in Greater Sandhill Crane Modeled Habitat Associated with Alternative 4 (acres)[a]

	Conservation Measure[b]	Habitat Type	Permanent		Temporary		Periodic[d]	
			NT	LLT	NT	LLT	Yolo	Floodplain
Habitat Affected[c]	CM1	Roosting/ Foraging	305	305	79	79	NA	NA
		Foraging	1,610	1,610	765	765	0	0
	Total Impacts CM1		**1,915**	**1,915**	**844**	**844**		
	CM2–CM10	Roosting/ Foraging	0	0	0	0	0	0
		Foraging	3,461	4,912	0	0	0	0
	Total Impacts CM2–CM18		**3,461**	**4,912**	**0**	**0**	**0**	**0**
	TOTAL IMPACTS		**5,376**	**6,827**	**844**	**844**	**0**	**0**
Habitat Restored/ Created[e]	CM3 managed wetland		320	320	NA	NA	NA	NA
	CM3 cultivated lands		305	305				
	Total Restoration/Creation		**625**	**625**				
	CM3 cultivated lands		14,444	14,444	NA	NA	NA	NA
	Total Protection		**14,444**	**14,444**				

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late long-term timeframes.

[b] See discussion below for a description of applicable CMs.

[c] LLT acreages are a summation of effects that would occur in the near-term, early long-term and late long-term timeframes. The LLT acreages represent the total amount of habitat that would be affected over the 50-year life of the BDCP and do not reflect habitat increases that would result from restoration, creation and protection activities.

[d] Periodic effects were estimated for the late long-term only. Yolo periodic impacts are presented as a range based on different flow regimes at the proposed notch in Fremont Weir.

[e] Restored/created and protected habitat acreages represent planned conservation activities that would be implemented over the lifetime of the BDCP (see BDCP Chapter 3, *Conservation Strategy*, for specifics).

NT = near-term

LLT = late long-term

NA = not applicable

Impact BIO-69: Loss or conversion of habitat for and direct mortality of greater sandhill crane

Alternative 4 conservation measures would result in the combined permanent and temporary loss of up to 7,671 acres of modeled roosting and foraging habitat for greater sandhill crane (of which 6,827 acres would be a permanent loss and 844 acres would be a temporary loss of habitat, Table 12-4-28). Conservation measures that would result in these losses are conveyance facilities and transmission line construction, and establishment and use of borrow and spoil areas (CM1), tidal habitat restoration (CM4), grassland restoration (CM8), and marsh restoration (CM10). The majority of habitat loss would result from conversion to tidal natural communities through CM4. Habitat enhancement and management activities (CM11), which include ground disturbance or removal of nonnative vegetation, could result in local adverse habitat effects. In addition, maintenance activities associated with the long-term operation of the water conveyance facilities and other BDCP physical facilities could degrade or eliminate greater sandhill crane modeled habitat. Each of these individual activities is described below. A summary statement of the combined impacts and NEPA and CEQA conclusions follows the individual conservation measure discussions.

- *CM1 Water Facilities and Operation*: Construction of Alternative 4 conveyance facilities would result in the combined permanent and temporary loss of up to 2,759 acres of modeled greater sandhill crane roosting and foraging habitat. This would consist of the permanent removal of 305 acres of roosting/foraging habitat, and 1,610 acres of foraging habitat. In addition, 79 acres of roosting/foraging habitat and 765 acres of foraging habitat would be temporarily removed (Table 12-4-28). Impacts from CM1 would consist of 868 acres of very high-value, 559 acres of high-value, and 622 acres of moderate-value foraging habitat (Table 12-4-29). Conveyance construction impacts would occur in CZ 3, CZ 5, and CZ 6, primarily in areas with relatively low crane use (Ivey pers. comm.). Refer to the Terrestrial Biology Map Book for a detailed view of Alternative 4 construction locations.

Table 12-4-29. Total amount of Greater Sandhill Crane Foraging Habitat affected by CM1 (Water Facilities and Operation) and other conservation measures (CM2-18).

Foraging Habitat Value Class	Land Cover Type	Acres Affected by CM1 **permanent** (temporary)	Acres Affected by CM2–CM18
Very high	Corn, rice	**648** (220)	255
High	Alfalfa, irrigated pasture, wheat, managed wetlands	**459** (100)	966
Moderate	Other grain crops (barley, oats, sorghum), grassland	**390** (273)	1,220
Low	Other irrigated field and truck crops, natural seasonal wetland, idle cropland	**114** (172)	821

There would be a 73 acre decrease in the loss of greater sandhill crane habitat with the construction of the east-west transmission line for Alternative 4 water conveyance facilities rather than the north-south transmission line. The construction of the east-west transmission line would result in the permanent loss of 289 acres of roosting/foraging habitat and 1,559 acres of foraging habitat. In addition, 83 acres of roosting/foraging habitat and 755 acres of foraging habitat would be temporarily removed.

- *CM4 Tidal Natural Communities Restoration*: Based on the hypothetical tidal restoration footprint, this activity would result in the permanent conversion of an estimated 3,262 acres of greater sandhill crane habitat, consisting entirely of foraging habitat. This loss would occur in the Cosumnes-Mokelume River and West Delta ROAs to tidal wetland natural community. Effects in CZ 4 associated with tidal wetland restoration activities would occur from the conversion of cultivated lands (including 255 acres of very high-value and 966 acres of high-value foraging habitat) to tidal wetlands. Tidal wetland restoration may in some areas provide habitat for cranes. In CZ 5, loss of modeled habitat would occur along the western edge of the greater sandhill crane winter use area and therefore would not result in fragmentation of traditional crane habitats. In CZ 4, tidal wetland restoration could occur between the high crane use area of the central Delta and the Cosumnes River Preserve. However, conversion to tidal wetlands in this area would not prohibit crane movement or reduce use of these important crane use areas.

- *CM8 Grassland Natural Community Restoration*: Approximately 300 acres of cultivated lands that provide foraging habitat for greater sandhill crane would be converted to grassland. No roosting/foraging habitat would be impacted by grassland restoration activities. The restored grasslands would continue to provide foraging habitat value for the sandhill crane.
- *CM10 Nontidal Marsh Restoration:* Nontidal marsh restoration would result in the permanent conversion of approximately 1,350 acres of modeled foraging habitat for the greater sandhill crane. The restored nontidal marsh would continue to provide roosting and foraging habitat value for the greater sandhill crane.
- *CM11 Natural Communities Enhancement and Management*: A variety of habitat management actions included in CM11 that are designed to enhance wildlife values in restored or protected habitats could result in localized ground disturbances that could temporarily remove small amounts of modeled habitat. Ground-disturbing activities, such as removal of nonnative vegetation and road and other infrastructure maintenance activities, would be expected to have minor adverse effects on available habitat and would be expected to result in overall improvements to and maintenance of habitat values over the term of the BDCP. The potential for these activities to result in direct mortality of greater sandhill crane would be minimized with the implementation of *AMM20 Greater Sandhill Crane*.
- Operations and Maintenance: Postconstruction operation and maintenance of the above-ground water conveyance facilities and restoration infrastructure could result in ongoing but periodic disturbances that could affect greater sandhill crane use of the surrounding habitat. Maintenance activities would include vegetation management, levee and structure repair, and re-grading of roads and permanent work areas. These effects, could be adverse as sandhill cranes are sensitive to disturbance. However, potentially significant impacts would be reduced by AMMs, and conservation actions as described below.
- Injury and Direct Mortality: Construction-related activities would not be expected to result in direct mortality of greater sandhill crane if they were present in the Plan Area, because they would be expected to avoid contact with construction and other equipment. Potentially adverse effects would be avoided and minimized with the implementation of *AMM20 Greater Sandhill Crane*. Injury and mortality from electrical transmission facilities are described below under Impact BIO-70.

The following paragraphs summarize the combined effects discussed above and describe other BDCP conservation actions that offset or avoid these effects. NEPA and CEQA impact conclusions are also included.

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the effects of construction would not be adverse under NEPA and would be less than significant under CEQA. With Plan implementation, there would be a combined permanent and temporary loss of 384 acres of modeled roosting/foraging habitat and 5,836 acres of modeled foraging habitat for greater sandhill crane in the study area in the near-term. These effects would result from the construction of the water conveyance facilities (CM1, 384 acres of roosting/foraging and 2,375 acres of foraging habitat, and implementing other conservation measures (*CM4 Tidal Natural Communities Restoration*, *CM8 Grassland Natural Communities Restoration*, and *CM10 Nontidal Marsh Restoration*—3,461 acres of foraging habitat).

The typical NEPA and CEQA project-level mitigation ratio for those natural communities affected by CM1 and that are identified in the biological goals and objectives for greater sandhill crane in Chapter 3 of the BDCP would be 1:1 for protection of habitat. Using this ratio would indicate that 2,759 acres of natural communities that benefit greater sandhill crane should be protected to mitigate for the CM1 losses of 2,759 acres of greater sandhill crane habitat. The offsetting acreage would need to be 2,686 acres of protection if the east-west transmission line alignment was selected for Alternative 4. Detailed impacts from the two transmission line alignments are discussed below under Impact BIO-70. The near-term effects of other conservation actions would remove 3,461 acres of greater sandhill crane habitat, and therefore require 3,461 acres of protection using the same typical NEPA and CEQA ratio (1:1 for protection).

The BDCP has committed to near-term goals of restoring 625 acres of roosting habitat (consisting of managed wetland and flooded harvested corn fields) and protecting 14,444 acres of foraging habitat in the study area. These conservation actions would occur in the same timeframe as the construction and early restoration losses, thereby reducing adverse effects on Greater sandhill crane. To ensure that this natural community conservation benefits the species, the Plan's biological goals and objectives (BDCP Chapter 3) further specify that the 320 acres of managed wetlands would be created in minimum patch sizes of 40 acres within the greater sandhill crane Winter Use Area in CZ 3, 4, 5, or 6, and would be located with consideration of sea level rise. At least 40 acres of the created roosting habitat would be constructed within 2 miles of the Stone Lakes National Wildlife Refuge to promote the continued use and expansion of crane use at the Refuge and to provide connectivity between Stone Lakes and the Cosumnes River Preserve. The Plan also contains a commitment to create an additional 305 acres of roosting habitat within 2 miles of existing roost sites. The habitat would consist of active corn fields that are flooded following harvest to support roosting cranes and provide highest-value foraging habitat. Individual fields would be at least 40 acres and could move throughout the Greater Sandhill Crane Winter Use Area. If greater sandhill cranes abandon known roost sites as a result of covered activities, The Plan has committed to create new roost sites of equal size in the Winter Use Area in CZ 3, 4, 5, or 6. The created roost would be within 2 miles of the affected roost and adjacent to other protected crane foraging habitat.

Species specific goals and objectives for the species further specify that of the cultivated lands protected by the late long-term time period, at least 5,000 acres would be managed for high- to very high-value habitat for the greater sandhill crane (Table 12-4-28), with at least 80% maintained in very high-value types (corn and rice) in any given year. The 5,000 acres would be within 2 miles of known roost sites in CZ 3, 4, 5, and/or 6 and would be protected in minimum patch sizes of 160 acres. Part of the high- to very high-value habitat would be created through the conversion of low-value habitat for sandhill crane. In addition, seasonal wetlands and upland edges that occur in association with cultivated lands would be maintained and protected through *CM3 Natural Communities Protection and Restoration* and *CM11 Natural Communities Enhancement and*

Management. These Plan goals represent performance standards for considering the effectiveness of restoration actions and would inform the near-term restoration efforts. The 625 acres of restoration required to meet the near-term biological goals and objectives for greater sandhill crane would satisfy the typical mitigation that would be applied to the project-level effects of habitat loss resulting from CM1, and would mitigate the near-term effects of the other conservation measures. Still, the near-term loss of 384 acres of roosting habitat could have an adverse effect on greater sandhill crane. Mitigation Measure BIO-69a, *Restore greater sandhill crane roosting habitat prior to or within the first 2 years of project construction*, is available to address this effect.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training*, *AMM2 Construction Best Management Practices and Monitoring, AMM3 Stormwater Pollution Prevention Plan*, *AMM4 Erosion and Sediment Control Plan*, *AMM5 Spill Prevention, Containment, and Countermeasure Plan*, *AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan*, *AMM7 Barge Operations Plan*, and *AMM20 Greater sandhill crane*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas. The AMMs are described in detail in BDCP Appendix 3.C.

Late Long-Term Timeframe

Based on modeled habitat, the study area supports approximately 16,490 acres of roosting/foraging habitat and 158,217 acres of foraging habitat for greater sandhill crane. Alternative 4 as a whole would result in the permanent loss of and temporary effects to 384 acres of roosting/foraging habitat and 7,287 acres of foraging habitat for greater sandhill crane during the term of the Plan (2% of the total roosting/foraging habitat in the study area and 4% of the total foraging habitat in the study area. The locations of these losses are described above in the analyses of individual conservation measures. The Plan includes a commitment to restore or create at least 625 acres of roosting habitat (consisting of managed wetlands and flooded harvested corn) and 14,444 acres of foraging habitat for greater sandhill crane in the study area (Table 12-4-28). Of the foraging habitat protected, a minimum of 5,000 acres of cultivated lands would be managed in high to very high-value habitats (with at least 80% of the 5,000 acres managed as very high-value crops, primarily corn). Restoration and protection would occur in CZ 3, 4, 5, and/or 6. There are other factors relevant to effects on greater sandhill crane:

- A large proportion of the crane use area, while modeled as suitable crane habitat, is currently unoccupied by cranes in any given year.
- A small proportion (4%) of the total available modeled crane habitat would be permanently removed.
- The agricultural habitat value that would be permanently lost would be replaced in equal proportion through protecting and enhancing other agricultural.
- Because agricultural habitat values change over time based largely on economically driven agricultural practices, protecting crane habitat would provide enhanced stability to agricultural habitat value within the crane use area that does not currently exist.

The loss of greater sandhill crane habitat associated with Alternative 4 as a whole would represent an adverse effect as a result of habitat modification of a special-status species and potential for direct mortality in the absence of other conservation actions. However, with habitat protection and restoration associated with *CM3 Natural Communities Protection and Restoration* and *CM11 Natural Communities Enhancement and Management*, guided by biological goals and objectives and

AMM1–AMM7, and *AMM20 Greater Sandhill Crane*, which would be in place throughout the time period any construction activity would be occurring, the effects of habitat loss from Alternative 4 as a whole on greater sandhill crane would not be adverse under NEPA.

CEQA Conclusion: Alternative 4 (CM1, CM4, CM8 and CM10) would have both temporary and permanent impacts on greater sandhill crane and its modeled habitat and operation of construction equipment could disturb individuals.

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the effects of construction would be less than significant under CEQA. With Plan implementation, there would be a combined permanent and temporary loss of 384 acres of modeled roosting/foraging habitat and 5,836 acres of modeled foraging habitat for greater sandhill crane in the study area in the near-term. These impacts would result from the construction of the water conveyance facilities (CM1, 384 acres of roosting/foraging and 2,375 acres of foraging habitat, and implementing other conservation measures (*CM4 Tidal Natural Communities Restoration*, *CM8 Grassland Natural Communities Restoration*, and *CM10 Nontidal Marsh Restoration*—3,461 acres of foraging habitat).

The typical NEPA and CEQA project-level mitigation ratio for those natural communities affected by CM1 and that are identified in the biological goals and objectives for greater sandhill crane in Chapter 3 of the BDCP would be 1:1 for protection of habitat. Using this ratio would indicate that 2,759 acres of natural communities that benefit greater sandhill crane should be protected to mitigate for the CM1 losses of 2,759 acres of greater sandhill crane habitat. The offsetting acreage would need to be 2,686 acres of protection if the east-west transmission line alignment was selected for Alternative 4. Detailed impacts from the two transmission line alignments are discussed below under Impact BIO-70. The near-term effects of other conservation actions would remove 3,461 acres of greater sandhill crane habitat, and therefore require 3,461 acres of protection using the same typical NEPA and CEQA ratio (1:1 for protection).

The BDCP has committed to near-term goals of restoring 625 acres of roosting habitat (consisting of managed wetland and flooded harvested corn fields) and protecting 14,444 acres of foraging habitat in the study area. These conservation actions would occur in the same timeframe as the construction and early restoration losses, thereby reducing adverse effects on Greater sandhill crane. To ensure that this natural community conservation benefits the species, the Plan's biological goals and objectives (BDCP Chapter 3) further specify that the 320 acres of managed wetlands would be created in minimum patch sizes of 40 acres within the greater sandhill crane Winter Use Area in CZ 3, 4, 5, or 6, and would be located with consideration of sea level rise. At least 40 acres of the created roosting habitat would be constructed within 2 miles of the Stone Lakes National Wildlife Refuge to promote the continued use and expansion of crane use at the Refuge and to provide connectivity between Stone Lakes and the Cosumnes River Preserve. The Plan also contains a commitment to create an additional 305 acres of roosting habitat within 2 miles of existing roost sites. The habitat would consist of active corn fields that are flooded following harvest to support roosting cranes and provide highest-value foraging habitat. Individual fields would be at least 40 acres and could move throughout the Greater Sandhill Crane Winter Use Area. If greater sandhill cranes abandon known roost sites as a result of covered activities, The Plan has committed to create new roost sites of equal size in the Winter Use Area in CZ 3, 4, 5, or 6. The created roost would be within 2 miles of the affected roost and adjacent to other protected crane foraging habitat.

- Species specific goals and objectives for the species further specify that of the cultivated lands protected by the late long-term time period, at least 5,000 acres would be managed for high- to very high-value habitat for the greater sandhill crane (Table 12-4-28), with at least 80% maintained in very high-value types (corn and rice) in any given year. The 5,000 acres would be within 2 miles of known roost sites in CZ 3, 4, 5, and/or 6 and would be protected in minimum patch sizes of 160 acres. Part of the high- to very high-value habitat would be created through the conversion of low-value habitat for sandhill crane. In addition, seasonal wetlands and upland edges that occur in association with cultivated lands would be maintained and protected through CM3 Natural Communities Protection and Restoration and CM11 Natural Communities Enhancement and Management. These plan goals represent performance standards for considering the effectiveness of restoration actions and would inform the near-term restoration efforts. The 625 acres of restoration required to meet the near-term biological goals and objectives for greater sandhill crane would satisfy the typical mitigation that would be applied to the project-level impacts of habitat loss resulting from CM1, and would mitigate the near-term impacts of the other conservation measures. Still, the near-term loss of 384 acres of roosting habitat could have a significant impact on greater sandhill crane. Implementation of Mitigation Measure BIO-69a, *Restore greater sandhill crane roosting habitat prior to or within the first 2 years of project construction*, would reduce this impact to a less-than-significant level. The foraging habitat protection activities would be concluded in the first 10 years of Plan implementation, which is close enough in time to the occurrence of impacts ton constitute adequate mitigation for CEQA purposes. *AMMs 1–7* and *AMM20 Greater Sandhill Crane* would minimize potentially significant impacts on the species from construction-related habitat loss and noise disturbance.

Late Long-Term Timeframe

The permanent and temporary habitat loss from CM1–CM10 in the late long-term timeframe would be 384 acres of roosting/foraging habitat and 7,287 acres of foraging habitat for greater sandhill crane; this represents 2% and 4% of the total roosting/foraging habitat and foraging habitat in the study area respectively. The Plan includes a commitment to restore or create at least 625 acres of roosting habitat (consisting of managed wetlands and flooded harvested corn) and 14,444 acres of foraging habitat for greater sandhill crane in the study area (Table 12-4-28). Of the foraging habitat protected, a minimum of 5,000 acres of cultivated lands would be managed in high to very high-value habitats (with at least 80% of the 5,000 acres managed as very high-value crops, primarily corn). Restoration and protection would occur in CZ 3, 4, 5, and/or 6. The BDCP also includes AMM1–AMM7 and *AMM20 Greater Sandhill Crane* directed at minimizing or avoiding potential impacts on individuals and adjacent habitats during construction and operation of the CMs.

Considering these protection and restoration provisions, which would provide acreages of new or enhanced habitat in amounts sufficient to compensate for habitats lost to construction and restoration activities, loss of habitat or direct mortality through implementation of Alternative 4 would not result in a substantial adverse effect through habitat modifications and would not substantially reduce the number or restrict the range of the species. Therefore, the alternative would have a less-than-significant impact on greater sandhill crane.

Mitigation Measure BIO-69a: Restore greater sandhill crane roost habitat prior to or within the first two years of project construction

To reduce the impact of the loss of crane roost habitat to a less-than-significant level, the 625 acres of roost site creation in the near-term time period must be created prior to or within the first two years of project construction.

Impact BIO-70: Effects on greater sandhill crane associated with electrical transmission facilities

New transmission lines would increase the risk for bird-power line strikes, which could result in injury or mortality of greater sandhill crane. Greater sandhill cranes are susceptible to collision with power lines and other structures during periods of inclement weather and low visibility (Avian Power Line Interaction Committee 1994, Brown and Drewien 1995, Manville 2005). The existing network of power lines in the Plan Area currently poses this risk for sandhill cranes. New transition lines would increase this risk and have an adverse effect on the species.

As described in *Analysis of Bird Collisions at BDCP Power Lines,* Appendix 5.J, the potential mortality of greater sandhill crane in the area of the proposed transmission lines were estimated using collision mortality rates by Brown and Drewien (1995) and an estimate of potential crossings along the proposed lines. Results indicate that in the absence of any line marking to increase visibility and reduce collision risk (i.e., without minimization measures), the average annual mortality of greater sandhill crane at permanent lines would be up to 124 individuals, depending on the orientation of the line and the rate of collisions per crossing. An additional 110 annual fatalities would be estimated to occur at temporary lines.

The risk for bird-power line strikes would be minimized with the implementation of AMM20 Greater Sandhill Crane. This measure would ensure that conductor and ground lines be fitted with flight diverters in compliance with the best available practices, such as those specified in the USFWS Avian Protection Guidelines. With these flight diverters in place, it is estimated that mortality would be reduced by 60% (Yee 2008), reducing annual mortality to 50 individuals per year at the north-south permanent line and 44 individuals at the temporary line. The assessment estimates that crane mortality would be over five times greater for the north-south option relative to the east-west option (for permanent lines) due primarily to the estimated number of crossings associated with each option. Thus, estimated annual mortality at marked permanent lines for the north-south option would be up to 50 cranes and estimated annual mortality at marked permanent lines for the east-west option would be approximately 10 cranes.

CEQA Conclusion: The existing network of power lines in the Plan Area currently poses a risk for sandhill cranes. New transition lines would increase the risk for bird-power line strikes, which could result in injury or mortality of greater sandhill crane. If the east-west powerline for the Alternative 4 water conveyance facility was selected, it would reduce estimated annual mortality by approximately one fifth. The implementation of *AMM20 Greater Sandhill Crane* would reduce, but would not preclude the risk of mortality from power line strike.

Impact BIO-71: Indirect effects of plan implementation on greater sandhill crane

Indirect construction-related effects: There are 8,804 acres of greater sandhill crane habitat within the vicinity of proposed construction areas that could be indirectly affected by construction activities. Indirect effects associated with construction include noise, dust, and visual disturbance caused by grading, filling, contouring, and other ground-disturbing operations outside the project footprint but within 1,300 feet from the construction edge. Noise and visual disturbance could affect sandhill crane use of the surrounding agricultural lands. *AMM20 Greater Sandhill Crane* would require set-back buffers from crane use areas during construction activities. The use of mechanical equipment during water conveyance facilities construction could cause the accidental release of petroleum or other contaminants that could affect greater sandhill crane in the surrounding habitat. The inadvertent discharge of sediment or excessive dust adjacent to greater sandhill crane habitat could also affect the species. AMM1–AMM7, including *AMM2 Construction Best Management Practices and Monitoring*, would minimize the likelihood of such spills and ensure that measures are in place to prevent runoff from the construction area and negative effects of dust on foraging habitat.

Methylmercury Exposure: Covered activities have the potential to exacerbate bioaccumulation of mercury in covered species, including greater sandhill crane. Marsh (tidal and nontidal) and floodplain restoration also have the potential to increase exposure to methylmercury. Mercury is transformed into the more bioavailable form of methylmercury in aquatic systems, especially areas subjected to regular wetting and drying such as tidal marshes and flood plains. Thus, BDCP restoration activities that create newly inundated areas could increase bioavailability of mercury (see BDCP Chapter 3, *Conservation Strategy*, for details of restoration). Increased methylmercury associated with natural community and floodplain restoration may indirectly affect greater sandhill crane via uptake in lower tropic levels (BDCP Appendix 5.D, *Contaminants*). In general, the highest methylation rates are associated with high tidal marshes that experience intermittent wetting and drying and associated anoxic conditions (Alpers et al. 2008). The potential mobilization or creation of methylmercury within the Plan Area varies with site-specific conditions and would need to be assessed at the project level. *CM12 Methylmercury Management* includes provisions for project-specific Mercury Management Plans. Along with minimization and mitigation measures and adaptive management and monitoring, *CM12 Methylmercury Management* would be available to address the uncertainty of methylmercury levels in restored tidal marsh and potential impacts on greater sandhill crane.

The potential indirect effects of increased mercury exposure is likely low for greater sandhill crane for the following reasons: 1) greater sandhill cranes occur in the Plan Area only during the nonbreeding winter months, 2) their primary foraging habitats in the Plan Area are cultivated crops, and 3) the use of restored tidal wetlands by cranes is likely to be limited compared to seasonal managed wetlands.

CEQA Conclusion: Impacts of noise, the potential for hazardous spills, increased dust and sedimentation, and operations and maintenance of the water conveyance facilities would be less than significant with the implementation of *AMM20 Greater Sandhill Crane* and AMM1–AMM7. The implementation of tidal natural communities restoration or floodplain restoration could result in increased exposure of greater sandhill crane to methylmercury. The potential indirect effects of increased mercury exposure is likely low for greater sandhill crane for the following reasons: 1) greater sandhill cranes occur in the Plan Area only during the nonbreeding winter months, 2) their primary foraging habitats in the Plan Area are cultivated crops, and 3) the use of restored tidal wetlands by cranes is likely to be limited compared to seasonal managed wetlands. Site-specific restoration plans that address the creation and mobilization of mercury, as well as monitoring and adaptive management as described in *CM12 Methylmercury Management*, would be available to address the uncertainty of methylmercury levels in restored tidal marsh and potential impacts on greater sandhill crane.

Lesser Sandhill Crane

Lesser sandhill cranes in the study area are almost entirely dependent on privately owned agricultural lands for foraging. Long-term sustainability of the lesser sandhill crane is thus dependent on providing a matrix of compatible crop types that afford suitable foraging habitat and maintaining compatible agricultural practices, while sustaining and increasing the extent of other essential habitat elements such as night roosting habitat. The habitat model for lesser sandhill crane identified suitable foraging and roosting habitat in the study area as certain agricultural types, specific grassland types, irrigated pastures and hay crops, managed seasonal wetland, and other natural seasonal wetland. Factors included in assessing the value of affected habitat for the lesser sandhill crane also includes the relative habitat vale of specific crop or land cover types. Lesser sandhill cranes are less traditional than greater sandhill cranes and are more likely to move between different roost site complexes and different wintering regions (Ivey pers. comm.) The wintering range is ten times larger than the greater sandhill crane and their average foraging flight radius from roost sites is twice that of greater sandhill cranes. Because of this higher mobility, lesser sandhill cranes would be more flexible in their use of foraging areas.

Construction and restoration associated with Alternative 4 conservation measures would result in both temporary and permanent losses of foraging and roosting habitat for lesser sandhill crane as indicated in Table 12-4-30. Full implementation of Alternative 4 would restore or create lesser sandhill crane roosting habitat consisting of 320 acres of managed wetlands in patch sizes of 40 acres, and 305 acres of active corn fields flooded through harvest. In addition, 14,444 acres of foraging habitat and 645 acres of roosting habitat would be protected (Table 12-4-30). Of the 14,444 acres of protected foraging habitat, at least 5,000 acres will be of high- to very high-value for the lesser sandhill crane. This protected area will be within 2 miles of known roosting sites in Conservation Zones 3, 4, 5, and/or 6 and will consider sea level rise, and the location of habitat loss. Patch size of cultivated lands will be at least 160 acres. As explained below, with the restoration or protection of these amounts of habitat, in addition to AMMs and mitigation measures described below to minimize potential adverse effects, impacts on lesser sandhill crane would not be adverse for NEPA purposes and would be less than significant for CEQA purposes.

Table 12-4-30. Changes in Lesser Sandhill Crane Modeled Habitat Associated with Alternative 4 (acres)[a]

	Conservation Measure[b]	Habitat Type	Permanent		Temporary		Periodic[d]	
			NT	LLT	NT	LLT	Yolo	Floodplain
Habitat Affected[c]	CM1	Roosting/ Foraging	305	305	79	79	NA	NA
		Foraging	1,877	1,877	829	829	0	0
	Total Impacts CM1		**2,182**	**2,182**	**908**	**908**		
	CM2–CM10	Roosting/ Foraging	0	0	0	0	0	0
		Foraging	3,676	5,713	0	0	0	0
	Total Impacts CM2–CM18		**3,676**	**5,713**	**0**	**0**	**0**	**0**
	TOTAL IMPACTS		**5,858**	**7,895**	**908**	**908**	**0**	**0**
Habitat Restored/ Created[e]	CM3 managed wetland		320	320	NA	NA	NA	NA
	CM3 cultivated lands		305	305				
	Total Restoration/ Creation		**625**	**625**				
	CM3 cultivated lands		14,444	14,444	NA	NA	NA	NA

Total Protection	**14,444**	**14,444**

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late long-term timeframes.
[b] See discussion below for a description of applicable CMs.
[c] LLT acreages are a summation of effects that would occur in the near-term, early long-term and late long-term timeframes. The LLT acreages represent the total amount of habitat that would be affected over the 50-year life of the BDCP and do not reflect habitat increases that would result from restoration, creation and protection activities.
[d] Periodic effects were estimated for the late long-term only. Yolo periodic impacts are presented as a range based on different flow regimes at the proposed notch in Fremont Weir.
[e] Restored/created and protected habitat acreages represent planned conservation activities that would be implemented over the lifetime of the BDCP (see BDCP Chapter 3, *Conservation Strategy*, for specifics).
NT = near-term
LLT = late long-term
NA = not applicable

Impact BIO-72: Loss or conversion of habitat for and direct mortality of greater sandhill crane

Alternative 4 conservation measures would result in the combined permanent and temporary loss of up to 7,671 acres of modeled roosting and foraging habitat for lesser sandhill crane (of which 6,827 acres would be a permanent loss and 844 acres would be a temporary loss of habitat, Table 12-4-30). Conservation measures that would result in these losses are conveyance facilities and transmission line construction, and establishment and use of borrow and spoil areas from Water Facilities and Operation (CM1), Tidal Natural Communities Restoration (CM4), Grassland Natural Community Restoration (CM8), and Nontidal Marsh Restoration (CM10). The majority of habitat loss would result from conversion to tidal natural communities through CM4. Habitat enhancement and management activities (CM11), which include ground disturbance or removal of nonnative vegetation, could result in local adverse habitat effects. In addition, maintenance activities associated with the long-term operation of the water conveyance facilities and other BDCP physical facilities could degrade or eliminate lesser sandhill crane modeled habitat. Each of these individual activities is described below. A summary statement of the combined impacts and NEPA and CEQA conclusions follows the individual conservation measure discussions.

- *CM1 Water Facilities and Operation*: Construction of Alternative 4 conveyance facilities would result in the combined permanent and temporary loss of up to 3,090 acres of lesser sandhill crane habitat. This would consist of the permanent removal of 305 acres of roosting/foraging habitat, and 1,877 acres of foraging habitat. In addition, 79 acres of roosting/foraging habitat and 829 acres of foraging habitat would be temporarily removed (Table 12-4-30). Combined permanent and temporary impacts to foraging habitat from CM1 would consist of 1,748 acres of very high-value, 48 acres of high-value, and 640 acres of moderate-value foraging habitat (Table 12-4-31). Conveyance construction impacts would occur in CZ 3, CZ 5, and CZ 6, primarily in areas with relatively low crane use (Ivey pers. comm.). Refer to the Terrestrial Biology Map Book for a detailed view of Alternative 4 construction locations.

Table 12-4-31. Total amount of Lesser Sandhill Crane Foraging Habitat affected by CM1 (Water Facilities and Operation) and CM4 (Tidal Natural Communities Restoration).

Foraging Habitat	Acres Affected by CM1	Acres Affected by

Value Class		**permanent** (temporary)	CM4
Very high	Corn, alfalfa	**1,388** (360)	**549**
High	Irrigated pasture, rice	**17** (31)	**458**
Moderate	Grasslands, wheat, other grain crops (barley, oats, sorghum), managed seasonal wetlands	**360** (280)	**1,673**
Low	Other irrigated field and truck crops, natural seasonal wetland, idle cropland	**112** (158)	**1,383**

There would be a 12 acre decrease in the impact to roosting/foraging habitat and a 77 acre decrease in the loss of foraging habitat for lesser sandhill crane with the construction of the east-west transmission line for Alternative 4 water conveyance facilities rather than the north-south transmission line. The construction of the east-west transmission line would result in the permanent loss of 289 acres of roosting/foraging habitat and 1,806 acres of foraging habitat. In addition, 83 acres of roosting/foraging habitat and 823 acres of foraging habitat would be temporarily removed.

- *CM4 Tidal Natural Communities Restoration*: Based on the hypothetical tidal restoration footprint, this activity would result in the permanent conversion of an estimated 3,351 acres of lesser sandhill crane habitat, consisting entirely of winter foraging habitat. This loss would occur in the Cosumnes-Mokelume River and West Delta ROAs to tidal wetland natural community. Effects in CZ 4 associated with tidal wetland restoration activities would occur from the conversion of cultivated lands (including 549 acres of very high-value and 458 acres of high-value foraging habitat) to tidal wetlands (Table 12-4-31). Tidal wetland restoration may in some areas provide habitat for cranes. In CZ 5, loss of modeled habitat would occur along the western edge of the greater sandhill crane winter use area and therefore would not result in fragmentation of traditional crane habitats. In CZ 4, tidal wetland restoration could occur between the high crane use area of the central Delta and the Cosumnes River Preserve. However, conversion to tidal wetlands in this area would not prohibit crane movement or reduce use of these important crane use areas.
- *CM8 Grassland Natural Community Restoration*: Approximately 300 acres of cultivated lands (foraging habitat) would be converted to grassland. The restored grasslands would continue to provide foraging habitat value for the lesser sandhill crane.
- *CM10 Nontidal Marsh Restoration:* Nontidal marsh restoration would result in the permanent conversion of approximately 1,350 acres of modeled foraging habitat for the lesser sandhill crane. The restored nontidal marsh would continue to provide roosting and foraging habitat value for the lesser sandhill crane.
- *CM11 Natural Communities Enhancement and Management*: A variety of habitat management actions included in *CM11 Natural Communities Enhancement and Management* that are designed to enhance wildlife values in restored or protected habitats could result in localized ground disturbances that could temporarily remove small amounts of modeled habitat. Ground-disturbing activities, such as removal of nonnative vegetation and road and other infrastructure maintenance activities, would be expected to have minor adverse effects on available habitat and would be expected to result in overall improvements to and maintenance of habitat values

over the term of the BDCP. The potential for these activities to result in direct mortality of lesser sandhill crane would be minimized with the implementation of *AMM20 Greater Sandhill Crane*.

- Operations and Maintenance: Postconstruction operation and maintenance of the above-ground water conveyance facilities and restoration infrastructure could result in ongoing but periodic disturbances that could affect lesser sandhill crane use of the surrounding habitat. Maintenance activities would include vegetation management, levee and structure repair, and re-grading of roads and permanent work areas. These effects, could be adverse as sandhill cranes are sensitive to disturbance. However, potentially significant impacts would be reduced by AMMs, and conservation actions as described below.
- Injury and Direct Mortality: Construction-related activities would not be expected to result in direct mortality of lesser sandhill crane if they were present in the Plan Area, because they would be expected to avoid contact with construction and other equipment. Potentially adverse effects would be avoided and minimized with the implementation of *AMM20 Greater Sandhill Crane*. Injury and mortality from electrical transmission facilities are described below under Impact BIO-70.

The following paragraphs summarize the combined effects discussed above and describe other BDCP conservation actions that offset or avoid these effects. NEPA and CEQA impact conclusions are also included.

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the effects of construction would not be adverse under NEPA and would be less than significant under CEQA. With Plan implementation, there would be a combined permanent and temporary loss of 1,251 acres of roosting/foraging and 5,306 acres of foraging habitat for lesser sandhill crane in the study area in the near-term. These effects would result from the construction of the water conveyance facilities (CM1, 384 acres of roosting/foraging and 2,706 acres of foraging habitat, and implementing other conservation measures (Tidal Natural Communities Restoration [CM4], Grassland Natural Communities Restoration [CM8], and Nontidal Marsh Restoration [CM10], 867 acres of roosting/foraging and 2,600 acres of foraging habitat).

Typical NEPA and CEQA project-level mitigation ratios for those natural communities affected by CM1 would be 1:1 for protection of habitat. Using these typical ratios would indicate that 3,090 acres of natural communities that benefit lesser sandhill crane should be protected to mitigate for the CM1 losses of lesser sandhill crane habitat. The offsetting acreage would need to be 3,001 acres of protection if the east-west transmission line alignment was selected for Alternative 4. The near-term effects of other conservation actions would remove 3,467 acres of lesser sandhill crane habitat, and therefore require 3,467 acres of protection using the same typical NEPA and CEQA ratios (1:1 for protection).

The BDCP has committed to near-term goals of restoring 625 acres of roosting habitat (consisting of managed wetland and flooded harvested corn fields) and protecting 14,444 acres of foraging habitat in the study area which would benefit the lesser sandhill crane. These conservation actions would occur in the same timeframe as the construction and early restoration losses, thereby reducing adverse effects on lesser sandhill crane. To ensure that this natural community conservation benefits the species, the Plan's biological goals and objectives (BDCP Chapter 3) further specify that the 320 acres of managed wetlands would be created in minimum patch sizes of 40 acres within the greater sandhill crane Winter Use Area in CZ 3, 4, 5, or 6, and would be located with consideration of sea level rise. At least 40 acres of the created roosting habitat would be constructed within 2 miles of the Stone Lakes National Wildlife Refuge to promote the continued use and expansion of crane use at the Refuge and to provide connectivity between Stone Lakes and the Cosumnes River Preserve. The Plan also contains a commitment to create an additional 305 acres of roosting habitat within 2 miles of existing roost sites. The habitat would consist of active corn fields that are flooded following harvest to support roosting cranes and provide highest-value foraging habitat. Individual fields would be at least 40 acres and could move throughout the Greater Sandhill Crane Winter Use Area, which is within the lesser sandhill crane winter use area.

Of the cultivated lands protected by the late long-term time period, at least 5,000 acres would be managed for high- to very high-value habitat for the lesser sandhill crane (Table 12-4-30) in any given year. The 5,000 acres would be within 2 miles of known roost sites in CZ 3, 4, 5, and/or 6 and would be protected in minimum patch sizes of 160 acres. Part of the high- to very high-value habitat would be created through the conversion of low-value habitat for both sub-species of sandhill crane. In addition, seasonal wetlands and upland edges that occur in association with cultivated lands would be maintained and protected through *CM3 Natural Communities Protection and Restoration* and *CM11 Natural Communities Enhancement and Management*. These Plan goals represent performance standards for considering the effectiveness of restoration actions and would inform the near-term restoration efforts. The 625 acres of restoration required to meet the near-term biological goals and objectives for greater sandhill crane would also satisfy the typical mitigation that would be applied to the project-level effects of lesser sandhill crane habitat loss resulting from CM1, and would mitigate the near-term effects of the other conservation measures. Still, the near-term loss of 384 acres of roosting habitat could have an adverse effect on lesser sandhill crane. Mitigation Measure BIO-69a, *Restore greater sandhill crane roosting habitat prior to or within the first 2 years of project construction*, is available to address this effect on both greater and lesser sandhill crane.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training*, *AMM2 Construction Best Management Practices and Monitoring*, *AMM3 Stormwater Pollution Prevention Plan*, *AMM4 Erosion and Sediment Control Plan*, *AMM5 Spill Prevention, Containment, and Countermeasure Plan*, *AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan*, *AMM7 Barge Operations Plan*, and *AMM20 Greater sandhill crane*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas. The AMMs are described in detail in BDCP Appendix 3.C.

Late Long-Term Timeframe

Alternative 4 as a whole would result in the permanent loss of and temporary effects to 2,034 acres of roosting/foraging habitat and 7,707 acres of foraging habitat for lesser sandhill crane during the term of the Plan (12% of the total roosting/foraging habitat in the study area and 4% of the total foraging habitat in the study area). The locations of these losses are described above in the analyses of individual conservation measures. The Plan includes a commitment to restore or create at least 625 acres of roosting habitat (consisting of managed wetlands and flooded harvested corn) and 14,444 acres of foraging habitat for greater sandhill crane in the study area (Table 12-4-30). Of the foraging habitat protected, a minimum of 5,000 acres of cultivated lands would be managed in high- to very high-value habitats for lesser sandhill crane. Restoration and protection would occur in CZ 3, CZ 4, CZ 5, and/or CZ 6. There are two other factors relevant to effects on lesser sandhill crane.

- The agricultural habitat value that would be permanently lost would be replaced in equal proportion through protecting and enhancing other agricultural.
- Because agricultural habitat values change over time based largely on economically driven agricultural practices, protecting crane habitat would provide enhanced stability to agricultural habitat value within the crane use area that does not currently exist.

The loss of lesser sandhill crane habitat associated with Alternative 4 as a whole would represent an adverse effect as a result of habitat modification of a special-status species and potential for direct mortality in the absence of other conservation actions. However, with habitat protection and restoration associated with *CM3 Natural Communities Protection and Restoration* and *CM11 Natural Communities Enhancement and Management*, guided by biological goals and objectives and AMM1–AMM7, and *AMM20 Greater Sandhill Crane*, which would be in place throughout the time period of construction, the effects of habitat loss from Alternative 4 as a whole on lesser sandhill crane would not be adverse under NEPA.

CEQA Conclusion: Alternative 4 (CM1, CM4, CM8 and CM10) would have both temporary and permanent impacts on lesser sandhill crane and its modeled habitat and operation of construction equipment could disturb individuals.

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the impacts of construction would be less than significant. With Plan implementation, there would be a combined permanent and temporary loss of 1,251 acres of roosting/foraging and 5,306 acres of foraging habitat for lesser sandhill crane in the study area in the near-term. These impacts would result from the construction of the water conveyance facilities (CM1, 384 acres of roosting/foraging and 2,706 acres of foraging habitat, and implementing other conservation measures (Tidal Natural Communities Restoration [CM4], Grassland Natural Communities Restoration [CM8], and Nontidal Marsh Restoration [CM10], 867 acres of roosting/foraging and 2,600 acres of foraging habitat).

The typical NEPA and CEQA project-level mitigation ratio for those natural communities affected by CM1 would be 1:1 for protection of habitat. Using this ratio would indicate that 3,090 acres of natural communities that benefit lesser sandhill crane should be protected to mitigate for the CM1 losses of lesser sandhill crane habitat. The offsetting acreage would need to be 3,001 acres of protection if the east-west transmission line alignment was selected for Alternative 4. The near-term effects of other conservation actions would remove 3,467 acres of lesser sandhill crane habitat, and therefore require 3,467 acres of protection using the same typical NEPA and CEQA ratio (1:1 for protection).

The BDCP has committed to near-term goals of restoring 625 acres of roosting habitat (consisting of managed wetland and flooded harvested corn fields) and protecting 14,444 acres of foraging habitat in the study area which would benefit the lesser sandhill crane. These conservation actions would occur in the same timeframe as the construction and early restoration losses, thereby reducing adverse effects on lesser sandhill crane. To ensure that this natural community conservation benefits the species, the Plan's biological goals and objectives (BDCP Chapter 3) further specify that the 320 acres of managed wetlands would be created in minimum patch sizes of 40 acres within the greater sandhill crane Winter Use Area in CZ 3, 4, 5, or 6, and would be located with consideration of sea level rise. At least 40 acres of the created roosting habitat would be constructed within 2 miles of the Stone Lakes National Wildlife Refuge to promote the continued use and expansion of crane use at the Refuge and to provide connectivity between Stone Lakes and the Cosumnes River Preserve. The Plan also contains a commitment to create an additional 305 acres of roosting habitat within 2 miles of existing roost sites. The habitat would consist of active corn fields that are flooded following harvest to support roosting cranes and provide highest-value foraging habitat. Individual fields would be at least 40 acres and could move throughout the Greater Sandhill Crane Winter Use Area, which is within the lesser sandhill crane winter use area.

Of the cultivated lands protected by the late long-term time period, at least 5,000 acres would be managed for high- to very high-value habitat for the lesser sandhill crane (Table 12-4-30) in any given year. The 5,000 acres would be within 2 miles of known roost sites in CZ 3, CZ 4, CZ 5, and/or CZ 6 and would be protected in minimum patch sizes of 160 acres. Part of the high- to very high-value habitat would be created through the conversion of low-value habitat for both sub-species of sandhill crane. In addition, seasonal wetlands and upland edges that occur in association with cultivated lands would be maintained and protected through *CM3 Natural Communities Protection and Restoration* and *CM11 Natural Communities Enhancement and Management*. These plan goals represent performance standards for considering the effectiveness of restoration actions and would inform the near-term restoration efforts. The 625 acres of restoration required to meet the near-term biological goals and objectives for greater sandhill crane would also satisfy the typical mitigation that would be applied to the project-level impacts of lesser sandhill crane habitat loss resulting from CM1, and would mitigate the near-term impacts of the other conservation measures. Still, the near-term loss of 384 acres of roosting habitat could have a significant impact on lesser sandhill crane. Implementation of Mitigation Measure BIO-69a, *Restore greater sandhill crane roosting habitat prior to or within the first 2 years of project construction*, would reduce this impact on lesser sandhill crane to a less-than-significant level. The foraging habitat protection activities would be concluded in the first 10 years of Plan implementation, which is close enough in time to the occurrence of impacts ton constitute adequate mitigation for CEQA purposes. *AMMs 1–7* and *AMM20 Greater Sandhill Crane* would also minimize potentially significant impacts on lesser sandhill crane from construction-related habitat loss and noise disturbance.

Late Long-Term Timeframe

The permanent and temporary habitat loss from CM1–CM10 in the late long-term timeframe would be 2,034 acres of roosting/foraging habitat and 7,707 acres of foraging habitat for lesser sandhill crane; this represents 12% and 4% of the total roosting/foraging habitat and foraging habitat in the study area respectively. The locations of these losses are described above in the analyses of individual conservation measures. The Plan includes a commitment to restore or create at least 625 acres of roosting habitat (consisting of managed wetlands and flooded harvested corn) and 14,444 acres of foraging habitat for greater sandhill crane in the study area (Table 12-4-30). Of the foraging habitat protected, a minimum of 5,000 acres of cultivated lands would be managed in high- to very high-value habitats for lesser sandhill crane. Restoration and protection would occur in CZ 3, 4, 5, and/or 6. The BDCP also includes AMM1–AMM7 and *AMM20 Greater Sandhill Crane* directed at minimizing or avoiding potential impacts on individuals and adjacent habitats during construction and operation of the CMs which would also avoid and minimize impacts on lesser sandhill cranes.

Considering these protection and restoration provisions, which would provide acreages of new or enhanced habitat in amounts sufficient to compensate for habitats lost to construction and restoration activities, loss of habitat or direct mortality through implementation of Alternative 4 would not result in a substantial adverse effect through habitat modifications and would not substantially reduce the number or restrict the range of the sub-species. Therefore, the alternative would have a less-than-significant impact on lesser sandhill crane.

Mitigation Measure BIO-69a: Restore greater sandhill crane roost habitat prior to or within the first two years of project construction

See description of Mitigation Measure BIO-69a under Impact BIO-69.

Impact BIO-73: Effects on lesser sandhill crane associated with electrical transmission facilities

New transmission lines would increase the risk for bird-power line strikes, which could result in injury or mortality of lesser sandhill crane. Sandhill cranes are susceptible to collision with power lines and other structures during periods of inclement weather and low visibility (Avian Power Line Interaction Committee 1994, Brown and Drewien 1995, Manville 2005). The existing network of power lines in the Plan Area currently poses this risk for sandhill cranes. New transition lines would increase this risk and have an adverse effect on the species.

The potential mortality of greater sandhill crane in the area of the proposed transmission line was estimated using collision mortality rates by Brown and Drewien (1995) and an estimate of potential crossings along the proposed line (BDCP Attachment 5.J-2, *Memorandum: Analysis of Potential Bird Collisions at Proposed BDCP Transmission Lines*).

Results are applicable to lesser sandhill cranes and indicate that in the absence of any line marking to increase visibility and reduce collision risk (i.e., without minimization measures), the average annual take would be up to 124 individuals, depending on the orientation of the line and the rate of collisions per crossing. An additional estimated 110 annual fatalities would be expected at temporary lines. The risk for bird-power line strikes would be minimized with the implementation of *AMM20 Greater Sandhill Crane*. This measure would ensure that conductor and ground lines be fitted with flight diverters in compliance with the best available practices, such as those specified in the USFWS Avian Protection Guidelines. With these flight diverters in place, it is estimated that mortality would be reduced by 60% (Yee 2008), reducing annual mortality to 50 individuals per year for the permanent line and 44 individuals at the temporary line. The assessment estimates that crane mortality would be over five times greater for the north-south option relative to the east-west option (for permanent lines) due primarily to the estimated number of crossings associated with each option. Thus, estimated annual mortality at marked permanent lines for the north-south option would be up to 50 cranes and estimated annual mortality at marked permanent lines for the east-west option would be up to 10 cranes. To offset greater sandhill crane bird strike loss that may result from the permanent and temporary north-south powerline, *AMM20 Greater Sandhill Crane* also contains the commitment to place bird strike diverters on existing powerlines within 2 kilometers of known roost sites, which would also reduce collisions of lesser sandhill cranes.

CEQA Conclusion: The existing network of power lines in the Plan Area currently poses a risk for sandhill cranes. New transition lines would increase the risk for bird-power line strikes, which could result in injury or mortality of lesser sandhill crane. If the east-west powerline for the Alternative 4 water conveyance facility was selected, it would reduce estimated annual crane mortality by approximately one fifth. The implementation of *AMM20 Greater Sandhill Crane* would reduce, but would not preclude the risk of mortality from power line strike.

Impact BIO-74: Indirect effects of plan implementation on lesser sandhill crane

Indirect construction-related effects: Indirect effects associated with construction include noise, dust, and visual disturbance caused by grading, filling, contouring, and other ground-disturbing operations outside the project footprint but within 1,300 feet from the construction edge could have an adverse effect on lesser sandhill crane. In addition, noise and visual disturbance could affect sandhill crane use of the surrounding agricultural lands. *AMM20 Greater Sandhill Crane* would require set-back buffers from crane use areas during construction activities, which would also benefit lesser sandhill crane. The use of mechanical equipment during water conveyance facilities construction could cause the accidental release of petroleum or other contaminants that could affect lesser sandhill crane in the surrounding habitat. The inadvertent discharge of sediment or excessive dust adjacent to greater sandhill crane habitat could also affect the species. AMM1–AMM7, including *AMM2 Construction Best Management Practices and Monitoring*, would minimize the likelihood of such spills and ensure that measures are in place to prevent runoff from the construction area and negative effects of dust on sandhill crane foraging habitat.

Methylmercury Exposure: Covered activities have the potential to exacerbate bioaccumulation of mercury in lesser sandhill crane. Marsh (tidal and nontidal) and floodplain restoration also have the potential to increase exposure to methylmercury. Mercury is transformed into the more bioavailable form of methylmercury in aquatic systems, especially areas subjected to regular wetting and drying such as tidal marshes and flood plains (Alpers et al. 2008). Thus, BDCP restoration activities that create newly inundated areas could increase bioavailability of mercury (see BDCP Chapter 3, *Conservation Strategy*, for details of restoration). Increased methylmercury associated with natural community and floodplain restoration may indirectly affect lesser sandhill crane via uptake in lower tropic levels (BDCP Appendix 5.D, *Contaminants*). The potential mobilization or creation of methylmercury within the Plan Area varies with site-specific conditions and would need to be assessed at the project level. *CM12 Methylmercury Management* includes provisions for project-specific Mercury Management Plans. Along with minimization and mitigation measures and adaptive management and monitoring, *CM12 Methylmercury Management* would be available to address the uncertainty of methylmercury levels in restored tidal marsh and potential impacts on lesser sandhill crane.

The potential indirect effects of increased mercury exposure is likely low for lesser sandhill crane for the following reasons: 1) lesser sandhill cranes occur in the Plan Area only during the nonbreeding months, 2) their primary foraging habitats in the Plan Area are cultivated crops, and 3) the use of restored tidal wetlands by cranes is likely to be limited compared to seasonal managed wetlands.

CEQA Conclusion: Impacts of noise, the potential for hazardous spills, increased dust and sedimentation, and operations and maintenance of the water conveyance facilities would be less than significant on lesser sandhill crane with the implementation of *AMM20 Greater Sandhill Crane* and AMM1–AMM7. The implementation of tidal natural communities restoration or floodplain restoration could result in increased exposure of lesser sandhill crane to methylmercury. The potential indirect effects of increased mercury exposure is likely low for lesser sandhill crane for the following reasons: 1) lesser sandhill cranes occur in the Plan Area only during the nonbreeding months, 2) their primary foraging habitats in the Plan Area are cultivated crops, and 3) the use of restored tidal wetlands by cranes is likely to be limited compared to seasonal managed wetlands. However, the sensitivity of the species to methylmercury is largely unknown. Site-specific restoration plans that address the creation and mobilization of mercury, as well as monitoring and adaptive management as described in *CM12 Methylmercury Management*, would be available to address the uncertainty of methylmercury levels in restored tidal marsh and potential impacts on lesser sandhill crane.

Least Bell's Vireo and Yellow Warbler

Least Bell's vireo and yellow warbler modeled habitat identifies suitable nesting and migratory habitat as those plant alliances from the valley/foothill riparian modeled habitat that contain a dense shrub component, including all willow-dominated alliances.

Construction and restoration associated with Alternative 4 conservation measures would result in both temporary and permanent losses of least Bell's vireo and yellow warbler modeled habitat as indicated in Table 12-4-32. Full implementation of Alternative 4 would restore or create 5,000 acres, and protect 750 acres of riparian habitat (Table 12-4-32) and at least 1,000 acres would be managed as early- to mid-successional vegetation with a dense understory for these species. Of the 5,000 acres of restored riparian natural community, at least 3,000 acres would occur on restored seasonally inundated floodplain. As explained below, with the restoration or protection of these amounts of habitat, impacts on the least Bell's vireo and yellow warbler habitat would not be adverse for NEPA purposes and would be less than significant for CEQA purposes.

Table 12-4-32. Changes in Least Bell's Vireo and Yellow Warbler Modeled Habitat Associated with Alternative 4 (acres)[a]

	Conservation Measure[b]	Habitat Type	Permanent		Temporary		Periodic[d]	
			NT	LLT	NT	LLT	Yolo	Floodplain
Habitat Affected[c]	CM1	Riparian	28	28	16	16	NA	NA
	Total Impacts CM1		**28**	**28**	**16**	**16**		
	CM2–CM18	Riparian	515	789	137	158	45–82	147
	Total Impacts CM2–CM18		**515**	**789**	**137**	**158**	**45–82**	**147**
	TOTAL IMPACTS		**543**	**817**	**153**	**174**	**45–82**	**147**
Habitat Restored/ Created[e]	CM7 riparian restoration		800	5,000	NA	NA	NA	NA
	Total Restoration/Creation		**800**	**5,000**				
Habitat Protected[e]	CM3 riparian protection		750	750	NA	NA	NA	NA
	Total Protection		**750**	**750**				

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late long-term timeframes.

[b] See discussion below for a description of applicable CMs.

[c] LLT acreages are a summation of effects that would occur in the near-term, early long-term and late long-term timeframes. The LLT acreages represent the total amount of habitat that would be affected over the 50-year life of the BDCP and do not reflect habitat increases that would result from restoration, creation and protection activities.

[d] Periodic effects were estimated for the late long-term only. Yolo periodic impacts are presented as a range based on different flow regimes at the proposed notch in Fremont Weir.

[e] Restored/created and protected habitat acreages represent planned conservation activities that would be implemented over the lifetime of the BDCP (see BDCP Chapter 3, *Conservation Strategy*, for specifics).

NT = near-term
LLT = late long-term
NA = not applicable

Impact BIO-75: Loss or conversion of habitat for and direct mortality of least Bell's vireo and yellow warbler

Alternative 4 conservation measures would result in the combined permanent and temporary loss of up to 991 acres of modeled habitat for least Bell's vireo and yellow warbler (Table 12-4-32). Conservation measures that would result in these losses are conveyance facilities and transmission line construction, and establishment and use of borrow and spoil areas (CM1), Fremont Weir/Yolo Bypass Fisheries Improvements (CM2), Tidal Natural Communities Restoration (CM4), and Seasonally Inundated Floodplain Restoration (CM5). Habitat enhancement and management activities (CM11) which include ground disturbance or removal of nonnative vegetation, could result in local adverse habitat effects. In addition, maintenance activities associated with the long-term operation of the water conveyance facilities and other BDCP physical facilities could degrade or eliminate least Bell's vireo and yellow warbler habitat. Each of these individual activities is described below. A summary statement of the combined impacts and NEPA and CEQA conclusions follows the individual conservation measure discussions.

- *CM1 Water Facilities and Operation:* Construction of Alternative 4 conveyance facilities would result in the combined permanent and temporary loss of up to 44 acres of modeled least Bell's vireo and yellow warbler habitat (Table 12-4-32). Of the 44 acres of modeled habitat that would be removed for the construction of the conveyance facilities, 28 acres would be a permanent loss and 16 acres would be a temporary loss of habitat. Activities that would impact modeled habitat consist of tunnel, forebay, and intake construction, temporary access roads, and construction of transmission lines. Impacts from CM1 would occur in the central delta in CZ 3, CZ 4, CZ 5, CZ 6, and CZ 8. Refer to the Terrestrial Biology Map Book for a detailed view of Alternative 4 construction locations. Refer to the Terrestrial Biology Map Book for a detailed view of Alternative 4 construction locations.

  There would be a 3 acre increase in both temporary and permanent losses of least Bell's vireo and yellow warbler habitat associated with constructing the east-west transmission line for the Alternative 4 water conveyance facility rather than the north-south transmission line. This increase would be associated with construction along the Cosumnes River in the Cosumnes River Preserve.

- *CM2 Yolo Bypass Fisheries Enhancement*: Construction of Yolo Bypass fisheries enhancements would permanently remove approximately 216 acres and temporarily remove 137 acres of modeled least Bell's vireo and yellow warbler habitat in the Yolo Bypass in CZ 2.
- *CM4 Tidal Natural Communities Restoration*: Tidal habitat restoration site preparation and inundation would permanently remove an estimated 545 acres of modeled least Bell's vireo and yellow warbler habitat.
- *CM5 Seasonally Inundated Floodplain Restoration*: Construction of setback levees to restore seasonally inundated floodplain would permanently remove approximately 28 acres and temporarily remove 21 acres of modeled least Bell's vireo and yellow warbler habitat. Based on the riparian habitat restoration assumptions, a minimum of 3,000 acres of valley/foothill riparian habitat would be restored as a component of seasonally inundated floodplain restoration actions.

  Riparian restoration from CM4 and CM5 would increase the extent of least Bell's vireo and yellow warbler habitat within the Plan Area once the restored riparian vegetation has developed habitat functions for these species. The actual number of acres of valley/foothill riparian habitat that CM4 and CM5 would restore may differ from these estimates, depending on how closely the actual outcome of tidal habitat restoration approximates the assumed outcome.

- *CM6 Channel Margin Enhancement:* Approximately 37 acres of valley/foothill riparian habitat that could support habitat for least Bell's vireo and yellow warbler would be restored as a component of channel margin enhancement actions along 20 miles of river and slough channels in the Delta (CM6). If an additional 20 miles of channel margin are enhanced under adaptive management, another 37 acres of riparian habitat would be restored.
- *CM11 Natural Communities Enhancement and Management:* Habitat protection and management activities that could be implemented in protected least Bell's vireo and yellow warbler habitats are expected to maintain and improve the functions of the habitat over the term of the BDCP. Least Bell's vireo and yellow warbler would be expected to benefit from the increase in protected habitat, which would maintain conditions favorable for future species establishment in the Plan Area. If least Bell's vireo and yellow warbler established breeding populations in restored riparian habitats in the Plan Area, occupied habitat would be monitored to determine if there were a need to implement controls on brood parasites (brown-headed cowbird) or nest predators. If implemented, these actions would be expected to benefit the least Bell's vireo and yellow warbler by removing a potential stressor that could, if not addressed, adversely affect the stability of newly established populations.

  Habitat management- and enhancement-related activities could disturb least Bell's vireo and yellow warbler nests. If either species were to nest in the vicinity of a worksite, equipment operation could destroy nests, and noise and visual disturbances could lead to their abandonment, resulting in mortality of eggs and nestlings. The potential for these activities to result in direct mortality of least Bell's vireo or yellow warbler would be minimized with the implementation of *AMM23 Suisun Song Sparrow, Yellow-Breasted Chat, Least Bell's Vireo, Western Yellow-Billed Cuckoo* and Mitigation Measure BIO-75, *Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds.*
- Operations and Maintenance: Postconstruction operation and maintenance of the above-ground water conveyance facilities and restoration infrastructure could result in ongoing but periodic disturbances that could affect least Bell's vireo and yellow warbler use of the surrounding habitat. Maintenance activities would include vegetation management, levee and structure repair, and re-grading of roads and permanent work areas. These effects, however, would be reduced by AMMs and conservation actions as described below.
- Injury and Direct Mortality: Although least Bell's vireo nesting has not been confirmed in the Plan Area, recent occurrences in the Yolo Bypass and at the San Joaquin River National Wildlife Refuge suggest that the reestablishment of a breeding population is a possibility over the duration of the BDCP. Construction-related activities would not be expected to result in direct mortality of least Bell's vireo or yellow warbler because adults and fledged young would be expected to avoid contact with construction and other equipment. However, if either species were to nest in the construction area, equipment operation, noise and visual disturbances could destroy nests or lead to their abandonment, resulting in mortality of eggs and nestlings. These effects would be avoided and minimized with the implementation of *AMM23 Suisun Song Sparrow, Yellow-Breasted Chat, Least Bell's Vireo, Western Yellow-Billed Cuckoo* and Mitigation Measure BIO-75, *Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds.*

- Temporarily affected areas would be restored as riparian habitat within 1 year following completion of construction activities. Although the effects are considered temporary, the restored riparian habitat would require 5 years to several decades, for ecological succession to occur and for restored riparian habitat to functionally replace habitat that has been affected. However, restored riparian vegetation can have the habitat structure to support breeding vireos within 3 to 5 years, particularly if the restored vegetation is adjacent to established riparian areas (Kus 2002), and similar habitat would be suitable for yellow warbler. The majority of the riparian vegetation to be temporarily removed is early- to mid-successional; therefore, the replaced riparian vegetation would be expected to have structural components comparable to the temporarily removed vegetation within the first 5 to 10 years after the initial restoration activities are complete.

The following paragraphs summarize the combined effects discussed above and describe other BDCP conservation actions that offset or avoid these effects. NEPA and CEQA impact conclusions are also included.

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the effects of construction would not be adverse under NEPA and would be less than significant under CEQA. The Plan would remove 696 acres of modeled habitat for least Bell's vireo and yellow warbler in the study area in the near-term. These effects would result from the construction of the water conveyance facilities (CM1, 44 acres of habitat), and implementing other conservation measures (Yolo Bypass Fisheries Enhancement [CM2] tidal restoration [CM4], Seasonally Inundated Floodplain Restoration [CM5], 652 acres of habitat). These losses would take place throughout the study area.

Typical NEPA and CEQA project-level mitigation ratios for those natural communities affected by CM1 and that are identified in the biological goals and objectives for least Bell's vireo in Chapter 3 of the BDCP would be 1:1 for restoration/creation and 1:1 protection of dense shrubby successional valley/foothill riparian habitat. Using these typical ratios would indicate that 44 acres of valley/foothill riparian habitat should be restored/created and 44 acres should be protected to mitigate for the CM1 losses of least Bell's vireo and yellow warbler habitat. The offsetting acreage would need to be 51 acres each of restoration and protection if the east-west transmission line alignment was selected for Alternative 4. Yellow warbler is a common migrant through the Cosumnes River Preserve. In addition, the Draft Recovery Plan identified the preserve as potential least Bell's vireo habitat. If either species were to become established in the area, the transmission line bisecting the preserve would increase perching structures for raptors and could increase the risk of predation on these species, adversely affecting their reproductive success. It would be highly desirable to reroute the eastern end of this alignment to avoid crossing the riparian reserve along the Cosumnes River. See Mitigation Measure BIO-9, *Avoid bisecting riparian corridor with east-west transmission line*, regarding this transmission line reroute. The near-term effects of other conservation actions would remove 652 acres of modeled habitat, and therefore require 652 acres of restoration and 652 acres of protection of dense shrubby valley/foothill riparian using the same typical NEPA and CEQA ratios (1:1 for restoration and 1:1 for protection).

The BDCP has committed to near-term goals of protecting 750 acres and restoring 800 acres of the valley/foothill riparian natural community in the study area. To ensure that natural community conservation benefits least Bell's vireo, the Plan's biological goals and objectives (BDCP, Chapter 3) further specify that of the 5,000 acres of riparian habitat restored/created in CZ 7 in the late long-term, at least 3,000 acres would be in wide bands and large, interconnected patches within restored seasonally inundated floodplain. This restoration would provide the large contiguous patches needed for suitable least Bell's vireo and yellow warbler breeding habitat and at least 1,000 acres of early- to mid-successional vegetation with a well-developed understory of dense shrubs would be maintained on restored seasonally inundated floodplain. Goals and objectives in the Plan for riparian restoration also include the restoration, maintenance and enhancement of structural heterogeneity with adequate vertical and horizontal overlap among vegetation components and over adjacent riverine channels, freshwater emergent wetlands, and grasslands. The biological goals and objectives would inform the near-term protection and restoration efforts and represent performance standards for considering the effectiveness of restoration actions.

The acres of protection contained in the near-term Plan goals satisfy the typical mitigation ratios that would be applied to the project-level effects of CM1 and the other near-term impacts. However, the restored riparian habitat would require 5 years to several decades, for ecological succession to occur and for restored riparian habitat to functionally replace habitat that has been affected. Because the modeled habitat impacted largely consists of small patches of blackberry, willow, and riparian scrub, and because least Bell's vireo and yellow warbler are not known to be established breeders in the Plan Area, BDCP actions would not be expected to have an adverse population-level effect on either species. Overall, BDCP riparian habitat restoration actions would be expected to benefit least Bell's vireo and yellow warbler by creating the potential for extending the species' breeding range northward.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training*, *AMM2 Construction Best Management Practices and Monitoring*, *AMM3 Stormwater Pollution Prevention Plan*, *AMM4 Erosion and Sediment Control Plan*, *AMM5 Spill Prevention, Containment, and Countermeasure Plan*, *AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan*, *AMM7 Barge Operations Plan*, and *AMM23 Suisun Song Sparrow, Yellow-Breasted Chat, Least Bell's Vireo, Western Yellow-Billed Cuckoo*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas and disposal sites. The AMMs are described in detail in BDCP Appendix 3.C. The yellow warbler is not a species that is covered under the BDCP. Although preconstruction surveys for least Bell's vireo may also detect yellow warblers (if they were to nest in the Plan Area over the course of the BDCP), in order to have a less than adverse effect on individuals, preconstruction surveys for non-covered avian species would be required to ensure that yellow warbler nests are detected and avoided. Mitigation Measure BIO-75 would be available to address potential adverse effects on nesting yellow warblers.

Late Long-Term Timeframe

Based on modeled habitat, the Plan Area supports approximately 14,933 acres of modeled habitat for least Bell's vireo and yellow warbler. Alternative 4 as a whole would result in the permanent loss of and temporary effects on 991 acres of habitat for these species during the term of the Plan (7% of the total habitat in the study area). The locations of these losses would be in fragmented riparian habitat throughout the study area. The Plan includes a commitment to restore or create at least 5,000 acres and protect at least 750 acres of valley/foothill riparian woodland in CZ 7. (Table 12-4-32). Of the 5,000 acres, a minimum of 3,000 acres of valley/foothill riparian would be restored within the seasonally inundated floodplain, and 1,000 acres would be managed as dense early to mid-successional riparian forest.

The loss of least Bell's vireo and yellow warbler habitat associated with Alternative 4 would represent an adverse effect as a result of habitat modification of a special-status species and potential for direct mortality in the absence of other conservation actions. However, neither species are established breeders in the study area and impacts would likely be limited to loss of migratory habitat for least Bell's vireo and yellow warbler. In addition, with habitat protection and restoration associated with CM3 and CM7, guided by biological goals and objectives and AMM1–AMM7 and AMM23, which would be in place throughout the time period any construction activity would be occurring, the effects of habitat loss and potential mortality under Alternative 4 on least Bell's vireo and would not be adverse under NEPA. The yellow warbler is not a species that is covered under the BDCP. Although preconstruction surveys for least Bell's vireo may also detect nesting yellow warblers, in order to have a less than adverse effect on individuals, preconstruction surveys for noncovered avian species would be required to ensure that yellow warbler nests are detected and avoided.

CEQA Conclusion: Alternative 4 (CM1–CM5, and CM11) would have both temporary and permanent impacts on least Bell's vireo, yellow warbler, and their modeled habitat and operation of construction equipment could injure or disturb individuals, if present in the study area.

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection and/or restoration in an appropriate timeframe to ensure that the impacts of construction would be less than significant. The Plan would remove 696 acres of modeled habitat for least Bell's vireo and yellow warbler in the study area in the near-term. These effects would result from the construction of the water conveyance facilities (CM1, 44 acres of habitat), and implementing other conservation measures (Yolo Bypass Fisheries Enhancement [CM2] tidal restoration [CM4], Seasonally Inundated Floodplain Restoration [CM5], 652 acres of habitat). These losses would take place throughout the study area.

Typical NEPA and CEQA project-level mitigation ratios for those natural communities affected by CM1 and that are identified in the biological goals and objectives for least Bell's vireo in Chapter 3 of the BDCP would be 1:1 for restoration/creation and 1:1 protection of dense shrubby successional valley/foothill riparian habitat. Using these typical ratios would indicate that 44 acres of valley/foothill riparian habitat should be restored/created and 44 acres should be protected to mitigate for the CM1 losses of least Bell's vireo and yellow warbler habitat. The offsetting acreage would need to be 51 acres each of restoration and protection if the east-west transmission line alignment was selected for Alternative 4. Yellow warbler is a common migrant through the Cosumnes River Preserve. In addition, the Draft Recovery Plan identified the preserve as potential least Bell's vireo habitat. If either species were to become established in the area, the transmission line bisecting the preserve would increase perching structures for raptors and could increase the risk of predation on these species, having a significant impact on their reproductive success. It would be highly desirable to reroute the eastern end of this alignment to avoid crossing the riparian reserve along the Cosumnes River. See Mitigation Measure BIO-9, *Avoid bisecting riparian corridor with east-west transmission line* regarding this transmission line reroute. The near-term effects of other conservation actions would remove 652 acres of tidal natural communities, and therefore require 652 acres of restoration and 652 acres of protection of dense shrubby valley/foothill riparian using the same typical NEPA and CEQA ratios (1:1 for restoration and 1:1 for protection).

The BDCP has committed to near-term goals of protecting 750 acres and restoring 800 acres of the valley/foothill riparian natural community in the study area. To ensure that this natural community conservation benefits least Bell's vireo, the Plan's biological goals and objectives (BDCP, Chapter 3) further specify that of the 5,000 acres of riparian habitat restored/created in CZ 7 in the late long-term, at least 3,000 acres would be in wide bands and large, interconnected patches within restored seasonally inundated floodplain. Restoration would provide the large contiguous patches needed for suitable least Bell's vireo and yellow warbler breeding habitat. A large fraction of the 5,000 acres of restored valley/foothill riparian woodland would be expected to provide suitable early- to mid-successional riparian vegetation for this species. Goals and objectives in The Plan for riparian restoration also include the restoration, maintenance and enhancement of structural heterogeneity with adequate vertical and horizontal overlap among vegetation components and over adjacent riverine channels, freshwater emergent wetlands, and grasslands. In addition, at least 1,000 acres of early- to mid-successional vegetation with a well-developed understory of dense shrubs would be maintained on restored seasonally inundated floodplain. The protection of 750 acres of existing valley/foothill riparian forest in CZ 7 would not necessarily provide in its entirety the vegetative structure needed to support these species. However, a portion of the protected habitat would provide suitable habitat for both species. The biological goals and objectives would inform the near-term protection and restoration efforts and represent performance standards for considering the effectiveness of restoration actions.

The acres of protection contained in the near-term Plan goals satisfy the typical mitigation ratios that would be applied to the project-level effects of CM1 and other near-term impacts. However, the restored riparian habitat would require 5 years to several decades, for ecological succession to occur and for restored riparian habitat to functionally replace habitat that has been affected. Because least Bell's vireo and yellow warbler are not known to be established breeders in the Plan Area, impacts would be limited to loss of migratory habitat, consisting of small patches of blackberry, willow, and riparian scrub. BDCP actions would not be expected to have an adverse population-level effect on either species. Overall, BDCP riparian habitat restoration actions would be expected to benefit least Bell's vireo and yellow warbler by creating the potential for extending the species' breeding range northward. Therefore, the acres of protection contained in the near-term Plan goals, in addition to the direction in the biological goals and objectives, would be sufficient to compensate for the near-term impacts of habitat loss from Alternative 4.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training*, *AMM2 Construction Best Management Practices and Monitoring, AMM3 Stormwater Pollution Prevention Plan*, *AMM4 Erosion and Sediment Control Plan*, *AMM5 Spill Prevention, Containment, and Countermeasure Plan*, *AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan*, *AMM7 Barge Operations Plan*, and *AMM23 Suisun Song Sparrow, Yellow-Breasted Chat, Least Bell's Vireo, Western Yellow-Billed Cuckoo*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas and disposal sites. The AMMs are described in detail in BDCP Appendix 3.C. The yellow warbler is not a species that is covered under the BDCP. Although preconstruction surveys for least Bell's vireo may also detect yellow warblers (if they were to nest in the Plan Area over the course of the BDCP), in order to have a less than adverse effect on individuals, preconstruction surveys for non-covered avian species would be required to ensure that yellow warbler nests are detected and avoided. Mitigation Measure BIO-75 would reduce the potential impact on nesting yellow warblers to a less-than-significant impact, should they become established in the Plan Area.

Late Long-Term Timeframe

Based on modeled habitat, the Plan Area supports approximately 14,933 acres of modeled habitat for least Bell's vireo and yellow warbler. Alternative 4 as a whole would result in the permanent loss of and temporary effects on 991 acres of habitat for these species during the term of the Plan (7% of the total habitat in the study area). The locations of these losses would be in fragmented riparian habitat throughout the study area. The Plan includes a commitment to restore or create at least 5,000 acres and protect at least 750 acres of valley/foothill riparian woodland in CZ 7. (Table 12-4-32).

Biological goals and objectives to restore, maintain and enhance structural heterogeneity and to maintain at least 1,000 acres of early- to mid-successional vegetation would also benefit species. The restored riparian habitat would require 5 years to several decades, for ecological succession to occur and for restored riparian habitat to functionally replace habitat that has been affected. Therefore, there would be a time-lag before the restored habitat would benefit either species. However, neither species are established breeders in the study area and impacts would likely be limited to loss of migratory habitat for least Bell's vireo and yellow warbler.

The BDCP includes a number of AMM1, AMM2, and AMM5 directed at minimizing or avoiding potential impacts on adjacent habitats during construction and operation of the conservation measures, and AMM23 which would minimize potential impacts on nesting least Bell's vireo, if they were present in the study area. The yellow warbler is not a species that is covered under the BDCP. Although preconstruction surveys for least Bell's vireo may also detect nesting yellow warblers, in order to have a less-than-significant impact on individuals, preconstruction surveys for noncovered avian species would be required to ensure that yellow warbler nests are detected and avoided. Mitigation Measure BIO-75 would reduce this potential impact on nesting yellow warblers, if present in the study area, to a less-than-significant level.

Considering these protection and restoration provisions, which would provide acreages of new or enhanced habitat in amounts greater than necessary to compensate for habitats lost to construction and restoration activities, and implementation of Mitigation Measure BIO-75, the loss of habitat or direct mortality through implementation of Alternative 4 would not result in a substantial adverse effect through habitat modifications and would not substantially reduce the number or restrict the range of the species. Therefore, the loss of habitat or mortality under this alternative would have a less-than-significant impact on least Bell's vireo and yellow warbler.

Mitigation Measure BIO-75: Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds

- To avoid removing or disturbing any active raptor nests, other special-status birds' nests, or nonspecial-status migratory bird nests, tree and shrub removal would be conducted during the nonbreeding season (generally between September 1 and February 1) or after a qualified biologist determines that fledglings have left an active nest. If this is not feasible, it is likely that there would be nesting birds in the Plan Area, which would require a buffer and avoidance during construction until the birds have fledged which could seriously constrain construction and result in project delays.

- If construction or tree-felling activities must occur during the breeding season (February 1 through September 1), a qualified wildlife biologist with knowledge of the species to be surveyed would be retained to conduct surveys for nesting birds in all tree and shrub and ground-nesting habitat located within 250 feet of construction activities, including grading. Bird nest surveys within 250 feet of construction activities can be conducted concurrent with white-tailed kite and Swainson's hawk surveys with at least one survey to be conducted no more than 48 hours from the initiation of project activities to confirm the absence of nesting.
- If the biologist determines that the area surveyed does not contain any active nests, construction activities, including removal or pruning of trees and shrubs, can commence without any further mitigation.
- If an active nest is located in the proposed disturbance area, the wildlife biologist would consult with CDFW to establish a suitable buffer zone. If a raptor nest is located within 250 feet or migratory bird nest is located within 100 feet of disturbance, and the disturbance must take place during the breeding season, a buffer zone would be established by the biologist and confirmed by the appropriate resource agency (CDFW and/or USFWS). The buffer area requirements are 250 feet for any active raptor nest and 100 feet for any migratory bird nest unless otherwise defined by CDFW and/or USFWS. A qualified wildlife biologist would monitor the nest to determine when the young have fledged and submit bi-weekly reports throughout the nesting season. The biological monitor would have the authority to cease construction if there is any sign of distress to any raptor or migratory bird. Reference to this requirement and the MBTA would be included in the construction specifications.

Impact BIO-76: Fragmentation of least Bell's vireo and yellow warbler habitat

Grading, filling, contouring, and other initial ground-disturbing operations may temporarily fragment modeled least Bell's vireo and yellow warbler habitat. This could temporarily reduce the affected habitat's extent and functions. Because there are only two recent occurrences of least Bell's vireo within the Plan Area, and no occurrences of yellow warbler breeding in the Plan Area, future occupancy would likely consist of only a small number of individuals, and any such habitat fragmentation is expected to have no or minimal effect on the species.

CEQA Conclusion: Because there are only two recent occurrences of least Bell's vireo within the Plan Area, and no occurrences of yellow warbler breeding in the Plan Area, habitat fragmentation resulting from ground-disturbing operations would have a less-than-significant impact on least Bell's vireo or yellow warbler.

Impact BIO-77: Effects on least Bell's vireo and yellow warbler associated with electrical transmission facilities

New transmission lines would increase the risk for bird-power line strikes, which could result in injury or mortality of least Bell's vireo and yellow warbler. The potential of this risk, however, is considered minimal based on the flight behaviors of the species. Yellow warbler is a common migrant through the Cosumnes River Preserve. In addition, the Draft Recovery Plan identified the preserve as potential least Bell's vireo habitat. If either species were to become established in the area, the transmission line bisecting the preserve would increase perching structures for raptors and could increase the risk of predation on these species, adversely affecting their reproductive success. It would be highly desirable to reroute the eastern end of this alignment to avoid crossing the riparian reserve along the Cosumnes River. Mitigation Measure BIO-9, *Avoid bisecting riparian corridor with east-west transmission line*, would be available to address this transmission line reroute.

CEQA Conclusion: Installation and presence of new transmission lines would not result in significant impacts on least Bell's vireo or yellow warbler because the probability of bird-powerline strikes is unlikely due to the flight behaviors of these species. If the east-west alignment for Alternative 4 was selected, and these species were to breed in the area, the placement of the transmission line through Cosumnes River Preserve would increase perching structures for raptors, which could increase predation in valuable riparian habitat. Rerouting the eastern portion of this transmission line to avoid the preserve through Mitigation Measure BIO-9, *Avoid bisecting riparian corridor with east-west transmission line*, would reduce this potential impact to a less-than-significant level.

Mitigation Measure BIO-9: Avoid bisecting riparian corridor with east-west transmission line

See description of Mitigation Measure BIO-9 under Impact BIO-9.

Impact BIO-78: Indirect effects of plan implementation on least Bell's vireo and yellow warbler

Indirect construction-related effects: If least Bell's vireo or yellow warbler were to nest in or adjacent to work areas, construction and subsequent maintenance-related noise and visual disturbances could mask calls, disrupt foraging and nesting behaviors, and reduce the functions of suitable nesting habitat for these species. *AMM23 Suisun Song Sparrow, Yellow-Breasted Chat, Least Bell's Vireo, Western Yellow-Billed Cuckoo* and Mitigation Measure BIO-75, *Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds*, would avoid the potential for adverse effects of construction-related activities on survival and productivity of nesting least Bell's vireo and yellow warbler. The use of mechanical equipment during water conveyance facilities construction could cause the accidental release of petroleum or other contaminants that could affect least Bell's vireo and yellow warbler in the surrounding habitat. The inadvertent discharge of sediment or excessive dust adjacent to suitable habitat could also have an adverse effect on these species. *AMM2 Construction Best Management Practices and Monitoring* would minimize the likelihood of such spills and ensure that measures are in place to prevent runoff from the construction area and negative effects of dust on active nests.

Methylmercury Exposure: Covered activities have the potential to exacerbate bioaccumulation of mercury in avian species, including the least Bell's vireo and yellow warbler. Marsh (tidal and nontidal) and floodplain restoration have the potential to increase exposure to methylmercury. Mercury is transformed into the more bioavailable form of methylmercury in aquatic systems, especially areas subjected to regular wetting and drying such as tidal marshes and flood plains (Alpers et al. 2008). Thus, BDCP restoration activities that create newly inundated areas could increase bioavailability of mercury (see BDCP Chapter 3, *Conservation Strategy*, for details of restoration). Species sensitivity to methylmercury differs widely and there is a large amount of uncertainty with respect to species-specific effects. Increased methylmercury associated with natural community and floodplain restoration could indirectly affect least Bell's vireo and yellow warbler, via uptake in lower tropic levels (as described in the BDCP, Appendix 5.D, *Contaminants*).

In addition, the potential mobilization or creation of methylmercury within the Plan Area varies with site-specific conditions and would need to be assessed at the project level. Measures described in Chapter 3 of the BDCP, Section 3.4.13, *CM12 Methylmercury Management* include provisions for Project-specific Mercury Management Plans. Site-specific restoration plans that address the creation and mobilization of mercury, as well as monitoring and adaptive management as described in CM12 would be available to address the uncertainty of methylmercury levels in restored tidal marsh and potential impacts on least Bell's vireo and yellow warbler.

CEQA Conclusion: Impacts of noise, the potential for hazardous spills, increased dust and sedimentation, and operations and maintenance of the water conveyance facilities would be less than significant with the implementation of *AMM23 Suisun Song Sparrow, Yellow-Breasted Chat, Least Bell's Vireo, Western Yellow-Billed Cuckoo*, Mitigation Measure BIO-75, *Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds*, and *AMM2 Construction Best Management Practices and Monitoring*. The implementation of tidal natural communities restoration or floodplain restoration could result in increased exposure of least Bell's vireo or yellow warbler to methylmercury, should they begin to nest in the study area. However, it is unknown what concentrations of methylmercury are harmful to these species. Sites-specific restoration plans that address the creation and mobilization of mercury, as well as monitoring and adaptive management as described in *CM12 Methylmercury Management*, would be available to address the uncertainty of methylmercury levels in restored tidal marsh and potential impacts on least Bell's vireo and yellow warbler.

Mitigation Measure BIO-75: Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds

See Mitigation Measure BIO-75 under Impact BIO-75.

Impact BIO-79: Periodic effects of inundation of least Bell's vireo and yellow warbler habitat as a result of implementation of conservation components

Flooding of the Yolo Bypass from Fremont Weir operations (CM2) would increase the frequency and duration of inundation of approximately 45–82 acres of modeled least Bell's vireo and yellow warbler habitat in CZ 2. No adverse effects of increased inundation frequency on least Bell's vireo, yellow warbler, or their habitat would be expected, because riparian vegetation supporting habitat has persisted under the existing Yolo Bypass flooding regime and changes to frequency and inundation would be within the tolerance of these vegetation types.

Based on hypothetical floodplain restoration for CM5, construction of setback levees could result in periodic inundation of up to 147 acres of modeled least Bell's vireo and yellow warbler habitat in CZ 7. Inundation of restored floodplains would not be expected to affect least Bell's vireo, yellow warbler, or their habitat because the breeding period is outside the period when floodplains would likely be inundated. Additionally, periodic inundation of floodplains would be expected to restore a more natural flood regime in support of riparian vegetation types that support least Bell's vireo and yellow warbler habitat. The overall effect of seasonal inundation in existing riparian natural communities would be beneficial, because, historically, flooding was the main natural disturbance regulating ecological processes in riparian areas, and flooding promotes the germination and establishment of many native riparian plants.

CEQA Conclusion: Implementation of CM2 and CM5 would result in periodic inundation of 45–82 acres (CM2) and 147 acres (CM5) of modeled habitat for least Bell's vireo and yellow warbler.

Periodic effects of inundation would have a less-than-significant impact on least Bell's vireo or yellow warbler because inundation would occur during the non-breeding season. Flooding promotes the germination and establishment of many native riparian plants. Therefore, the overall impact of seasonal inundation in existing riparian natural communities would be beneficial for least Bell's vireo and yellow warbler.

Suisun Song Sparrow and Saltmarsh Common Yellowthroat

The habitat model used to assess effects on Suisun song sparrow and saltmarsh common yellowthroat is based on primary breeding habitat and secondary habitat. Suisun song sparrow and saltmarsh common yellowthroat primary habitat consists of all *Salicornia*-dominated tidal brackish emergent wetland and all *Typha*-, *Scirpus*-, and *Juncus*-dominated tidal freshwater emergent wetland in the Plan Area west of Sherman Island, with the exception that *Scirpus acutus* and *S. californicus* plant communities (low marsh) and all of the plant communities listed below that occur in managed wetlands were classified as secondary habitat. Upland transitional zones, providing refugia during high tides, within 150 feet of the wetland edge were also included as secondary habitat. Secondary habitats generally provide only a few ecological functions such as foraging (low marsh and managed wetlands) or extreme high tide refuge (upland transition zones), while primary habitats provide multiple functions, including breeding, effective predator cover, and value forage. Construction and restoration associated with Alternative 4 conservation measures would result in both temporary and permanent losses of Suisun song sparrow and saltmarsh common yellowthroat modeled habitat as indicated in Table 12-4-33. The majority of the losses would take place over an extended period of time as tidal marsh is restored in the study area. Full implementation of Alternative 4 would restore or create a minimum of 3,000 acres of habitat for Suisun song sparrow and saltmarsh common yellowthroat (Table 12-4-33). As explained below, with the restoration or protection of these amounts of habitat, impacts on these species would not be adverse for NEPA purposes and would be less than significant for CEQA purposes.

Table 12-4-33. Changes in Suisun Song Sparrow Saltmarsh Common Yellowthroat Modeled Habitat Associated with Alternative 4 (acres)[a]

	Conservation Measure[b]	Habitat Type	Permanent		Temporary		Periodic[d]	
			NT	LLT	NT	LLT	Yolo	Floodplain
Habitat Affected[c]	CM1	Primary	NA	NA	NA	NA	NA	NA
		Secondary	NA	NA	NA	NA	NA	NA
	Total Impacts CM1							
	CM2–CM18	Primary	54	55	NA	NA	0	0
		Secondary	1,098	3,535	NA	NA	0	0
	Total Impacts CM2–CM18		**1,152**	**3,590**			**0**	**0**
	TOTAL IMPACTS		**1,152**	**3,590**			**0**	**0**
Habitat Restored/ Created[e]	CM4 tidal restoration		1,000	3,000	NA	NA	NA	NA
	Total Restoration/Creation		**1,000**	**3,000**				
Habitat Protected[e]	CM4 tidal restoration		NA	NA	NA	NA	NA	NA
	Total Protection							

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late long-term timeframes.

[b] See discussion below for a description of applicable CMs.

[c] LLT acreages are a summation of effects that would occur in the near-term, early long-term and late long-term timeframes. The LLT acreages represent the total amount of habitat that would be affected over the 50-year life of the BDCP and do not reflect habitat increases that would result from restoration, creation and protection activities.

[d] Periodic effects were estimated for the late long-term only. Yolo periodic impacts are presented as a range based on different flow regimes at the proposed notch in Fremont Weir.

[e] Restored/created and protected habitat acreages represent planned conservation activities that would be implemented over the lifetime of the BDCP (see BDCP Chapter 3, *Conservation Strategy*, for specifics).

NT = near-term

LLT = late long-term

NA = not applicable

Impact BIO-81: Loss or conversion of habitat for and direct mortality of Suisun song sparrow and saltmarsh common yellowthroat

Alternative 4 conservation measures would result in the permanent loss of up to 3,510 acres of modeled secondary habitat, the conversion of 55 acres of primary habitat to secondary low marsh, and the conversion of 25 acres of secondary habitat to middle or high marsh (for a total impact of 55 acres primary habitat and 3,590 acres of secondary habitat, Table 12-4-33). The only conservation measure that would affect modeled habitat for Suisun song sparrow and saltmarsh common yellowthroat is *CM4 Tidal Natural Communities Restoration*. Habitat enhancement and management activities (CM11), which include ground disturbance or removal of nonnative vegetation, could also result in local adverse habitat effects. Each of these individual activities is described below. A summary statement of the combined impacts and NEPA and CEQA conclusions follows the individual conservation measure discussions.

- *CM4 Tidal Natural Communities Restoration*: Site preparation and inundation would permanently remove approximately 3,510 acres of modeled secondary Suisun song sparrow and saltmarsh common yellowthroat habitat from CZ 11 (Table 12-4-33). Approximately 5,987 acres of habitat would be lost to inundation caused by tidal habitat restoration actions. In addition, 55 acres of primary habitat would be converted to secondary low marsh, and 25 acres of secondary habitat would be converted to middle or high marsh. Most areas proposed for removal would be managed wetlands that serve as relatively marginal habitat for Suisun song sparrow and saltmarsh common yellowthroat, which primarily use brackish tidal wetlands. Approximately 1.5% of primary habitat for these species would be converted to foraging habitat. Full implementation of CM4 would restore or create at least 3,000 acres of tidal brackish emergent wetland natural community in CZ 11, which would be expected to support Suisun song sparrow and saltmarsh common yellowthroat habitat. It is expected that restoring tidal wetland communities that are self-sustaining and not reliant on ongoing management actions necessary to maintain the existing managed wetland habitats would better ensure the long-term viability of these populations. Furthermore, effects of tidal habitat restoration on sparrow and yellowthroat abundance and distribution would be monitored, and the restoration of tidal habitat would be sequenced and located in a manner that minimizes effects on occupied habitats until functional habitats were restored (see BDCP Section 3.4.5, *CM4 Tidal Natural Communities Restoration*, and Section 3.6, *Adaptive Management and Monitoring Program*).
- *CM11 Natural Communities Enhancement and Management:* Control of nonnative Suisun song sparrow and saltmarsh common yellowthroat predators, if deemed necessary, is expected to reduce predation loss of nests and, consequently, increase and maintain the abundance of

Suisun song sparrow and saltmarsh common yellowthroat in restored tidal habitats over the term of the BDCP. Habitat management- and enhancement-related activities could disturb Suisun song sparrow or saltmarsh common yellowthroat nests if they are located near work sites. The potential for these activities to have an adverse effect on Suisun song sparrow would be avoided and minimized through *AMM23 Suisun Song Sparrow, Yellow-Breasted Chat, Least Bell's Vireo, Western Yellow-Billed Cuckoo*. In addition, Mitigation Measure BIO-75, *Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds*, would be available to address these effects on saltmarsh common yellowthroat. A variety of *CM11 Natural Communities Enhancement and Management* habitat management actions that are designed to enhance wildlife values in restored and protected tidal wetland habitats may result in localized ground disturbances that could temporarily remove small amounts of Suisun song sparrow and saltmarsh common yellowthroat habitat in CZ 11. Ground-disturbing activities, such as removal of nonnative vegetation and road and other infrastructure maintenance activities, are expected to have minor adverse effects on available species' habitat. Because the entire population of Suisun song sparrow is found within the Plan Area, tidal habitat restoration actions would be expected to benefit the entire Suisun song sparrow population by replacing marginal managed wetland habitat with high-value, self-sustaining tidal habitat, thus creating the potential for extending the species' abundance and distribution. Saltmarsh common yellowthroat would similarly benefit.

- Operations and Maintenance: Postconstruction operation and maintenance of the restoration infrastructure could result in ongoing but periodic disturbances that could affect Suisun song sparrow and saltmarsh common yellowthroat use of the surrounding habitat in Suisun. Maintenance activities could include vegetation management, and levee repair. These effects, however, would be reduced by AMMs and conservation actions as described below.
- Construction-related activities could result in nest destruction or disturbance resulting in mortality of eggs and nestlings if restoration activities took place within the nesting period for these species. *AMM23 Suisun Song Sparrow, Yellow-Breasted Chat, Least Bell's Vireo, Western Yellow-Billed Cuckoo* would minimize these potentially adverse effects on Suisun song sparrow. Mitigation Measure BIO-75, *Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds*, would be available to address these effects on saltmarsh common yellowthroat. Grading, filling, contouring, and other initial ground-disturbing operations during restoration activities could temporarily fragment existing modeled tidal brackish emergent wetland habitat for Suisun song sparrow and saltmarsh common yellowthroat which could temporarily reduce the extent and functions of the affected habitat. These temporary effects would be minimized through sequencing of restoration activities and through *AMM23 Suisun Song Sparrow, Yellow-Breasted Chat, Least Bell's Vireo, Western Yellow-Billed Cuckoo* and Mitigation Measure BIO-75.

The following paragraphs summarize the combined effects discussed above and describe other BDCP conservation actions that offset or avoid these effects. NEPA and CEQA impact conclusions are also included.

Near-Term Timeframe

Under Alternative 4, there would be no impacts resulting from the construction of the water conveyance facilities (CM1). However, there would be a permanent loss of 1,040 acres of modeled secondary habitat for Suisun song sparrow and saltmarsh common yellowthroat in the study area in the near-term. In addition, 54 acres of primary habitat would be converted to secondary foraging habitat, and 58 acres of secondary habitat would be converted to mid to high marsh, which would provide primary nesting habitat for these species. Although there would be a temporal lag in these conversions, there would be no net loss of primary habitat in the near-term. These effects would result from implementing CM4 tidal restoration in CZ 11. The typical NEPA and CEQA project-level mitigation ratio for those natural communities affected by CM4 and that are identified in the biological goals and objectives in Chapter 3 of the BDCP would be 1:1 for restoration/creation of tidal brackish emergent habitat. Using this ratio would indicate that 1,040 acres of tidal brackish emergent wetland should be restored/created to mitigate for the CM4 permanent losses of Suisun song sparrow and saltmarsh common yellowthroat habitat in the near-term.

The BDCP has committed to near-term goals of restoring 1,000 acres of tidal brackish emergent wetlands in the study area. Although this 1,000 acres is slightly less than the 1:1 restoration ratio, the secondary habitat that would be permanently lost would be primarily lower value managed wetlands, and this would be replaced with higher value tidal brackish marsh foraging habitat. These conservation actions would occur in the same timeframe as the early restoration losses. To ensure that this natural community conservation benefits the species, the Plan's biological goals and objectives (BDCP, Chapter 3) further specify that within the 3,000 acres of tidal brackish emergent marsh restored in the late long-term, at least 1,500 acres would be restored as high and mid marsh, providing primary habitat for these species. In addition, of the 8,000 acres of protected and 2,000 acres of restored grassland, in the late long-term, grasslands adjacent to restored tidal brackish emergent wetlands would be protected or restored, to provide at least 200 feet of adjacent grasslands beyond the sea level rise accommodation. This adjacent upland habitat would provide high tide refugia during high tide events, benefitting both species. These biological goals and objectives would inform the near-term restoration efforts and represent performance standards for considering the effectiveness of restoration actions. Tidal wetlands would be restored in a mosaic of large, interconnected and biologically diverse patches. Larger and more interconnected patches of suitable habitat would be expected to reduce the effects of habitat fragmentation that currently exist in Suisun marsh in CZ 11. Nonnative predators would be controlled as needed to reduce nest predation and to help maintain species abundance (CM11). Restoration would be sequenced over the term of the Plan and occur in a manner that would minimize any temporary, initial loss and fragmentation of habitat. The acres of restoration contained in the near-term Plan goals with the management and enhancement actions (CM11), and the incorporation of the additional measures in the biological goals and objectives (BDCP, Chapter 3) would be sufficient to mitigate for the near-term effects of tidal restoration.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training*, *AMM2 Construction Best Management Practices and Monitoring*, *AMM3 Stormwater Pollution Prevention Plan*, *AMM4 Erosion and Sediment Control Plan*, *AMM5 Spill Prevention, Containment, and Countermeasure Plan*, *AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan*, *AMM7 Barge Operations Plan*, and *AMM23 Suisun Song Sparrow, Yellow-Breasted Chat, Least Bell's Vireo, Western Yellow-Billed Cuckoo*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas. The AMMs are described in detail in BDCP Appendix 3.C. The saltmarsh common yellowthroat is not a species that is covered under the BDCP. Although preconstruction surveys for Suisun song sparrow would likely also detect nesting saltmarsh common yellowthroat, in order to avoid adverse effects on individuals, preconstruction surveys for noncovered avian species would be required to ensure that saltmarsh common yellowthroat nests are detected and avoided.

Late Long-Term Timeframe

Based on modeled habitat, the study area supports approximately 3,761 acres of primary and 23,997 acres of secondary habitat for Suisun song sparrow and saltmarsh common yellowthroat. Alternative 4 as a whole would result in the permanent loss of 3,510 acres of secondary habitat (15% of the total secondary habitat in the study area). In addition, 55 acres of primary habitat would be converted to secondary foraging habitat, and 25 acres of secondary habitat would be converted to primary habitat. The Plan includes a commitment to restore or create at least 3,000 acres of tidal brackish emergent wetlands in Suisun Marsh in CZ 11 (Table 12-4-33). the secondary habitat that would be permanently lost would be primarily lower value managed wetlands, and this would be replaced with higher value tidal brackish marsh foraging habitat. These conservation actions would occur in the same timeframe as the early restoration losses. To ensure that this natural community conservation benefits the species, the Plan's biological goals and objectives further specify that within the 3,000 acres of tidal brackish emergent marsh restored in the late long-term, at least 1,500 acres would be restored as high and mid marsh, providing primary habitat for these species. In addition, of the 8,000 acres of protected and 2,000 acres of restored grassland, in the late long-term, grasslands adjacent to restored tidal brackish emergent wetlands would be protected or restored, to provide at least 200 feet of adjacent grasslands beyond the sea level rise accommodation. This adjacent upland habitat would provide high tide refugia during high tide events, benefitting both species. These biological goals and objectives would inform the near-term restoration efforts and represent performance standards for considering the effectiveness of restoration actions. Tidal wetlands would be restored in a mosaic of large, interconnected and biologically diverse patches. Larger and more interconnected patches of suitable habitat would be expected to reduce the effects of habitat fragmentation that currently exist in Suisun marsh in CZ 11. Nonnative predators would be controlled as needed to reduce nest predation and to help maintain species abundance (CM11). Restoration would be sequenced over the term of the Plan and occur in a manner that would minimize any temporary, initial loss and fragmentation of habitat.

The loss of secondary habitat associated with Alternative 4 would represent an adverse effect as a result of habitat modification of a special-status species and potential for direct mortality in the absence of other conservation actions. However, with habitat protection and restoration associated with CM4, with the management and enhancement actions (CM11), and the incorporation of the additional measures in the biological goals and objectives, AMM1–AMM7 and AMM23, which would be in place throughout the time period any construction activity would be occurring, the effects of habitat loss and conversion from Alternative 4 on Suisun song sparrow would not be adverse under NEPA. Although preconstruction surveys for Suisun song sparrow would likely also detect nesting saltmarsh common yellowthroat, in order to avoid adverse effects on individuals, preconstruction surveys for noncovered avian species would be required to ensure that saltmarsh common yellowthroat nests are detected and avoided.

CEQA Conclusion: Alternative 4 (CM4) would have permanent impacts on Suisun song sparrow and saltmarsh common yellowthroat and their modeled habitat as the operation of construction equipment could injure or disturb individuals.

Near-Term Timeframe

Under Alternative 4, there would be no impacts resulting from the construction of the water conveyance facilities (CM1). However, there would be a permanent loss of 1,040 acres of modeled secondary habitat for Suisun song sparrow and saltmarsh common yellowthroat in the study area in the near-term. In addition, 54 acres of primary habitat would be converted to secondary foraging habitat, and 58 acres of secondary habitat would be converted to mid to high marsh, which would provide primary nesting habitat for these species. Although there would be a temporal lag in these conversions, there would be no net loss of primary habitat in the near-term. These effects would result from implementing CM4 tidal restoration in CZ 11. The typical NEPA and CEQA project-level mitigation ratio for those natural communities affected by CM4 and that are identified in the biological goals and objectives in Chapter 3 of the BDCP would be 1:1 for restoration/creation of tidal brackish emergent habitat. Using this ratio would indicate that 1,040 acres of tidal brackish emergent wetland should be restored/created to mitigate for the CM4 permanent losses of Suisun song sparrow and saltmarsh common yellowthroat habitat in the near-term.

The BDCP has committed to near-term goals of restoring 1,000 acres of tidal brackish emergent wetlands in the study area in CZ 11. Although this 1,000 acres is slightly less than the 1:1 restoration ratio, the secondary habitat that would be permanently lost would be primarily lower value managed wetlands, and this would be replaced with higher value tidal brackish marsh foraging habitat. These conservation actions would occur in the same timeframe as the early restoration losses. To ensure that this natural community conservation benefits the species, the Plan's biological goals and objectives further specify that within the 3,000 acres of tidal brackish emergent marsh restored in the late long-term, at least 1,500 acres would be restored as high and mid marsh, providing primary habitat for these species. In addition, of the 8,000 acres of protected and 2,000 acres of restored grassland, in the late long-term, grasslands adjacent to restored tidal brackish emergent wetlands would be protected or restored, to provide at least 200 feet of adjacent grasslands beyond the sea level rise accommodation. This adjacent upland habitat would provide high tide refugia during high tide events, benefitting both species. These biological goals and objectives would inform the near-term restoration efforts and represent performance standards for considering the effectiveness of restoration actions. Tidal wetlands would be restored in a mosaic of large, interconnected and biologically diverse patches. Larger and more interconnected patches of suitable habitat would be expected to reduce the effects of habitat fragmentation that currently exist in Suisun marsh in CZ 11. Nonnative predators would be controlled as needed to reduce nest predation and to help maintain species abundance (CM11). Restoration would be sequenced over the term of the Plan and occur in a manner that would minimize any temporary, initial loss and fragmentation of habitat. The acres of restoration contained in the near-term Plan goals with the management and enhancement actions (CM11), and the incorporation of the additional measures in the biological goals and objectives (BDCP Chapter 3) would be sufficient to mitigate for the near-term impacts of tidal restoration.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training*, *AMM2 Construction Best Management Practices and Monitoring, AMM3 Stormwater Pollution Prevention Plan*, *AMM4 Erosion and Sediment Control Plan*, *AMM5 Spill Prevention, Containment, and Countermeasure Plan*, *AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan*, *AMM7 Barge Operations Plan*, and *AMM23 Suisun Song Sparrow, Yellow-Breasted Chat, Least Bell's Vireo, Western Yellow-Billed Cuckoo.* All of these AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas and disposal sites. The AMMs are described in detail in BDCP Appendix 3.C. The saltmarsh common yellowthroat is not a species that is covered under the BDCP. Although preconstruction surveys for Suisun song sparrow may also detect nesting saltmarsh common yellowthroat, in order to have a less-than-significant effect on individuals, preconstruction surveys for noncovered avian species would be required to ensure that saltmarsh common yellowthroat nests are detected and avoided. Mitigation Measure BIO-75, *Conduct preconstruction* *nesting bird surveys and avoid disturbance of nesting birds*, would reduce the potential impact on nesting saltmarsh common yellowthroat to a less-than-significant impact.

The 1,000 acres of restoration contained in the near-term Plan goals, the additional direction in the biological goals and objectives, and management and enhancement activities in CM11, would be sufficient to support the conclusion that the near-term effects of habitat loss and direct mortality under Alternative 4 would be less than significant under CEQA, as AMM1–AMM7, AMM19, and Mitigation Measure BIO-75 would avoid and minimize potential impacts on the species from construction-related habitat loss.

Late Long-Term Timeframe

The permanent habitat loss from CM4 in the late long-term timeframe would be 3,510 acres of secondary habitat for Suisun song sparrow and saltmarsh common yellowthroat; this represents 15% of the total secondary modeled habitat in the study area. The Plan's *CM4 Tidal Natural Communities Restoration* includes a commitment to restore or create at least 3,000 acres of tidal brackish emergent wetlands in the study area in Suisun Marsh in CZ 11 (Table 12-4-33). The 3,761 acres of secondary habitat that would be permanently lost would be primarily lower value managed wetlands, and this would be replaced with 3,000 acres of higher value tidal brackish marsh foraging habitat which would mitigate for the loss of foraging habitat. Management and enhancement actions through CM11 and the implementation of additional measures in the goals and objectives (BDCP, Chapter 3) would also benefit both species. The BDCP includes a number of AMMs (AMM1–AMM7), directed at minimizing or avoiding potential impacts on adjacent habitats during construction and operation of the CMs, and AMM23 which would minimize potential impacts on nesting Suisun song sparrow. The saltmarsh common yellowthroat is not a covered species under the BDCP. Although preconstruction surveys for Suisun song sparrow may detect nesting saltmarsh common yellowthroat, in order to have a less-than-significant impact on individuals, preconstruction surveys for noncovered avian species would be required to ensure that saltmarsh common yellowthroat nests are detected and avoided. Mitigation Measure BIO-75 would reduce this potential impact on nesting saltmarsh common yellowthroat to a less-than-significant level.

Considering these restoration provisions, which would replace low-value secondary habitat with high-value tidal brackish emergent habitat, including both foraging and primary habitat, and provide upland refugia for Suisun song sparrow and saltmarsh common yellowthroat, the acreages of restoration are sufficient to mitigate for habitats lost to construction and restoration activities. Loss of habitat or direct mortality through implementation of Alternative 4, with the implementation of AMM1–AMM7, AMM23, and Mitigation Measure BIO-75, *Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds*, would not result in a substantial adverse effect through habitat modifications and would not substantially reduce the number or restrict the range of the species. Therefore, the loss of habitat or potential mortality under this alternative would have a less-than-significant impact on Suisun song sparrow and saltmarsh common yellowthroat.

Mitigation Measure BIO-75: Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds

See Mitigation Measure BIO-75 under Impact BIO-75.

Impact BIO-81: Indirect effects of plan implementation on Suisun song sparrow and saltmarsh common yellowthroat

Indirect construction-related effects: If least Bell's vireo or yellow warbler were to nest in or adjacent to work areas, construction and subsequent maintenance-related noise and visual disturbances could mask calls, disrupt foraging and nesting behaviors, and reduce the functions of suitable nesting habitat for these species. An estimated 871 acres of Suisun song sparrow and saltmarsh common yellowthroat habitat (287 acres of primary habitat) adjacent to restoration work areas could be affected by such disturbances, which could temporarily result in diminished use of habitat. If construction occurred during the nesting season, these indirect effects could result in the loss or abandonment of nests and mortality of any eggs and/r nestlings. *AMM23 Suisun Song Sparrow, Yellow-Breasted Chat, Least Bell's Vireo, Western Yellow-Billed Cuckoo* and Mitigation Measure BIO-75, *Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds*, would avoid the potential for adverse effects of construction-related activities on survival and productivity of Suisun song sparrow and saltmarsh common yellowthroat by requiring preconstruction surveys and, if nests are present, the establishment of a no-disturbance buffer within 250 feet of a nest site. The use of mechanical equipment during water conveyance facilities construction could cause the accidental release of petroleum or other contaminants that could affect species in the surrounding habitat. The inadvertent discharge of sediment or excessive dust adjacent to suitable habitat could also have an adverse effect on Suisun song sparrow and saltmarsh common yellowthroat. *AMM2 Construction Best Management Practices and Monitoring* would minimize the likelihood of such spills and ensure that measures are in place to prevent runoff from the construction area and any adverse effects of dust on active nests.

Methylmercury Exposure: Marsh (tidal and nontidal) and floodplain restoration have the potential to increase exposure to methylmercury. Mercury is transformed into the more bioavailable form of methylmercury in aquatic systems, especially areas subjected to regular wetting and drying such as tidal marshes and flood plains (Alpers et al. 2008). Thus, BDCP restoration activities that create newly inundated areas could increase bioavailability of mercury (see BDCP Chapter 3, *Conservation Strategy*, for details of restoration). Although tidal habitat restoration might increase methylation of mercury export to other habitats, restoration is unlikely to significantly increase the exposure of methylmercury to Suisun song sparrow or saltmarsh common yellowthroat, as they currently reside in tidal marshes where elevated methylmercury levels exist. Robinson et al. (2011) found toxic levels of methylmercury levels in song sparrow populations from southern San Francisco Bay, although populations near Suisun Marsh (i.e., San Pablo and Simas Creeks) were much lower. The potential mobilization or creation of methylmercury within the Plan Area varies with site-specific conditions and would need to be assessed at the project level. The Suisun Marsh Plan anticipates that restored tidal wetlands would generate less methylmercury than the existing managed wetlands to be restored (Bureau of Reclamation et al. 2010). *CM12 Methylmercury Management* includes provisions for project-specific Mercury Management Plans. Along with minimization and mitigation measures and adaptive management and monitoring, CM12 would be available to address the uncertainty of methylmercury levels resulting from restored tidal marsh in the Plan Area.

Salinity: Water conveyance facilities operations would have an effect on salinity gradients in Suisun Marsh; however, these effects cannot be reasonably disaggregated from effects resulting from tidal habitat restoration. It is expected that the salinity of water in Suisun Marsh would generally increase as a result of water conveyance facilities operations and operations of salinity control gates to mimic a more natural water flow. This would likely encourage the establishment of tidal wetland plant communities tolerant of more saline environments, which should have a beneficial effect on Suisun song sparrow and saltmarsh common yellowthroat because their historical natural Suisun Marsh habitat is brackish tidal marsh. However, the degree to which salinity changes in all tidal channels and sloughs in and around Suisun Marsh would be highly variable.

CEQA Conclusion: Impacts of noise, the potential for hazardous spills, increased dust and sedimentation, and operations and maintenance of the water conveyance facilities would be less than significant with the implementation of *AMM23 Suisun Song Sparrow, Yellow-Breasted Chat, Least Bell's Vireo, Western Yellow-Billed Cuckoo*, Mitigation Measure BIO-75, *Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds*, and *AMM2 Construction Best Management Practices and Monitoring*. Changes in salinity gradients should have a beneficial impact on Suisun song sparrow and saltmarsh common yellowthroat through the establishment of tidal marsh similar to historic conditions. The implementation of tidal natural communities restoration (CM4) is unlikely to significantly increase the exposure of methylmercury to Suisun song sparrow or saltmarsh common yellowthroat, as they currently reside in tidal marshes where elevated methylmercury levels exist. However, it is unknown what concentrations of methylmercury are harmful to these species. Sites-specific restoration plans that address the creation and mobilization of mercury, as well as monitoring and adaptive management as described in *CM12 Methylmercury Management*, would better inform potential impacts and address the uncertainty of methylmercury levels in restored tidal marsh in the Plan Area.

Mitigation Measure BIO-75: Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds

See Mitigation Measure BIO-75 under Impact BIO-75.

Impact BIO-82: Effects on Suisun song sparrow and saltmarsh common yellowthroat associated with electrical transmission facilities

The range of the Suisun song sparrow extends eastward into the Plan Area to approximately Kimball Island. There are several reported occurrences from Kimball Island, Browns Island, and in the Suisun Marsh in the western portion of the Plan Area. The easternmost range of the saltmarsh common yellowthroat also ends in Suisun Marsh. These species ranges, along with areas of suitable habitat, are far from the proposed transmission line routes (BDCP Attachment 5.J-2, *Memorandum: Analysis of Potential Bird Collisions at Proposed BDCP Transmission Lines*). Location of the current populations, species ranges, and suitable habitat in the plan area make collision with the proposed transmission lines highly unlikely. Therefore the construction and presence of new transmission lines would not have an adverse effect on Suisun song sparrow and saltmarsh common yellowthroat.

CEQA Conclusion: The construction and presence of new transmission lines would have a less-than-significant impact on Suisun song sparrow and saltmarsh common yellowthroat because the location of the current populations, species ranges, and suitable habitat for the species make collision with the proposed transmission lines highly unlikely.

Swainson's Hawk

The habitat model used to assess impacts on Swainson's hawk includes plant alliances and land cover types associated with Swainson's hawk nesting and foraging habitat. Construction and restoration associated with Alternative 4 conservation measures would result in both temporary and permanent losses of Swainson's hawk modeled habitat as indicated in Table 12-4-34. The majority of the losses would take place over an extended period of time as tidal marsh is restored in the study area. Although restoration for the loss of nesting and foraging habitat would be initiated in the same timeframe as the losses, it would take years (for foraging habitat) and 1 or more decades (for nesting habitat) for restored habitats to replace the functions of habitat lost. This time lag between impacts and restoration of habitat function would be minimized through specific tree planting requirements of *AMM18 Swainson's Hawk and White-Tailed Kite*, including number of plantings, location, species of trees, and monitoring, associated with restoration success. In addition, restoration to offset impacts on nesting habitat within the first 10 years would be initiated within 18 months of Plan approval. Full implementation of Alternative 4 would impact 696 acres of nesting habitat and restore or create 5,000 acres of valley/foothill riparian forest, and protect 750 acres of existing valley/foothill riparian forest, portions of which would provide nesting structures for Swainson's hawks (i.e., large mature trees). The BDCP contains a commitment to restore 800 acres and protect 750 acres of riparian habitat in the first 10 years. In addition, temporarily affected riparian areas would be restored as riparian habitat within 1 year following completion of construction activities. The loss of foraging habitat would be mitigated with the protection and enhancement of 48,760 acres of cultivated lands and natural communities that provide foraging habitat for the species. As explained below, with the restoration or protection of these amounts of habitat, in addition to management activities that would enhance these natural communities for the species, impacts on Swainson's hawk would not be adverse for NEPA purposes and would be less than significant for CEQA purposes.

Table 12-4-34. Changes in Swainson's Hawk Modeled Habitat Associated with Alternative 4 (acres)[a]

	Conservation Measure[b]	Habitat Type	Permanent		Temporary		Periodic[d]	
			NT	LLT[c]	NT	LLT	Yolo	Floodplain
Habitat Affected[c]	CM1	Breeding	13	13	13	13	NA	NA
		Foraging	3,812	3,812	1,181	1,181	NA	NA
	Total Impacts CM1		**3,825**	**3,825**	**1,194**	**1,194**		
	CM2–CM18	Breeding	382	542	97	128	39–67	188
		Foraging	8,513	46,820	489	1,517	3,100–6,579	8,027
	Total Impacts CM2–CM18		**8,895**	**47,362**	**586**	**1,645**	**3,144–6,645**	**8,216**
	TOTAL IMPACTS		**12,720**	**51,187**	**1,780**	**2,839**	**3,144–6,645**	**8,216**
Habitat Restored/ Created[e]	CM3 alkali seasonal wetland		58	72	NA	NA	NA	NA
	CM7 riparian		800	5,000	NA	NA	NA	NA
	CM8 grassland		1,140	2,000				
	CM9 vernal pool		40	67	NA	NA	NA	NA
	Total Restoration/Creation		**2,038**	**7,139**				
Habitat Protected[e]	CM3 riparian		750	NA	NA	NA	NA	NA
	CM3 grassland		2,000	8,000	NA	NA	NA	NA
	CM3 alkali seasonal wetland		120	150	NA	NA	NA	NA
	CM3 vernal pool		400	600	NA	NA	NA	NA
	CM3 cultivated lands		14,600	40,010	NA	NA	NA	NA
	Total Protection		**17,870**	**48,760**				

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late long-term timeframes.

[b] See discussion below for a description of applicable CMs.

[c] LLT acreages are a summation of effects that would occur in the near-term, early long-term and late long-term timeframes. The LLT acreages represent the total amount of habitat that would be affected over the 50-year life of the BDCP and do not reflect habitat increases that would result from restoration, creation and protection activities.

[d] Periodic effects were estimated for the late long-term only. Yolo periodic impacts are presented as a range based on different flow regimes at the proposed notch in Fremont Weir.

[e] Restored/created and protected habitat acreages represent planned conservation activities that would be implemented over the lifetime of the BDCP (see BDCP Chapter 3, *Conservation Strategy*, for specifics).

NT = near-term

LLT = late long-term

NA = not applicable

Impact BIO-83: Loss or conversion of habitat for and direct mortality of Swainson's hawk

Alternative 4 conservation measures would result in the combined permanent and temporary loss of up to 54,026 acres of modeled habitat for Swainson's hawk (Table 12-4-34). Conservation measures that would result in these losses are Water Facilities and Operation (CM1) (which would involve conveyance facilities and transmission line construction, and establishment and use of borrow and spoil areas), Yolo Bypass Fisheries Enhancement (CM2), Tidal Natural Communities Restoration (CM4), Seasonally Inundated Floodplain Restoration (CM5), Channel Margin Enhancement (CM6), Grassland Natural Communities Restoration (CM8), Vernal Pool and Alkali Seasonal Wetland Complex Restoration (CM9), and Conservation Hatcheries (CM18). Habitat enhancement and management activities (CM11), which include ground disturbance or removal of nonnative vegetation, could result in local habitat effects. In addition, maintenance activities associated with the long-term operation of the water conveyance facilities and other BDCP physical facilities could affect Swainson's hawk modeled habitat. Each of these individual activities is described below. A summary statement of the combined impacts and NEPA and CEQA conclusions follows the individual conservation measure discussions.

- *CM1 Water Facilities and Operation*: Construction of Alternative 4 water conveyance facilities would result in the combined permanent and temporary loss of up to 5,019 acres of modeled Swainson's hawk habitat, composed of 26 acres of breeding habitat and 4,993 acres of foraging habitat (Table 12-4-34). Activities that would impact modeled Swainson's hawk habitat consist of tunnel, forebay, and intake construction, temporary access roads, and construction of transmission lines. Of the 26 acres of nesting habitat that would be removed for the construction of the conveyance facilities, 13 acres would be a permanent loss and 13 acres would be a temporary loss of habitat. Most of the permanent loss would occur where Intakes 1–5 impact the Sacramento River's east bank between Freeport and Courtland. The riparian areas here are very small patches, some dominated by valley oak and others by nonnative trees. Temporary losses would occur where pipelines cross Snodgrass Slough and other small waterways east of the Sacramento River, and where temporary work areas surround intake sites. The riparian habitat in these areas is also composed of very small patches or stringers bordering waterways, which are composed of valley oak and scrub vegetation. Of the 4,993 acres of foraging habitat that would be removed for the construction of the conveyance facilities, 3,825 acres would be a permanent loss and 1,194 acres would be a temporary loss of foraging habitat. Foraging habitat impacts would include 1,043 acres of very high-value habitat (Table 12-4-35). Impacts resulting from CM1 would occur in the central Delta in CZ 3, CZ 4, CZ 5, CZ 6, and CZ 8. Refer to the Terrestrial Biology Map Book for a detailed view of Alternative 4 construction locations.

There would be an 8-acre increase in loss of permanent and temporary breeding habitat for Swainson's hawk associated with the constructing the east-west alignment of the transmission line rather than the north-south transmission line. However, there would be a 741-acre decrease in loss of foraging habitat.

Table 12-4-35. Acres of Impacted Foraging Habitat by Value Classes for Swainson's Hawk

Foraging Habitat Value Class	Cultivated Land and Other Land Cover Types	Acres from CM1 **Permanent** (temporary)	Acres from Other CMs **Permanent** (temporary)
Very high	Alfalfa hay	**914** (130)	**13,315** (416)
High	Irrigated pasture, other hay crops	**17** (30)	**6,257** (63)
Moderate	Tomatoes, sugar beets, grain crops (wheat, barley, oats), grasslands, managed wetlands, vernal pool complex, alkali seasonal wetland complex.	**744** (588)	**13,422** (1,124)
Low	Other irrigated field and truck/berry crops	**345** (68)	**6,219** (194)
Very low	Safflower, sunflower, corn, grain sorghum	**1,162** (366)	**7,586** (568)

- *CM2 Yolo Bypass Fisheries Enhancement:* Construction of the Yolo bypass fisheries enhancement would result in the permanent removal of 209 acres of nesting habitat and 883 acres of foraging habitat for Swainson's hawk in the late long-term. In addition, CM2 would temporarily remove 97 acres of nesting habitat and 489 acres of foraging habitat for the species. Impacts from CM2 would occur in the near-term timeframe. Activities through CM2 could involve excavation and grading in valley/foothill riparian areas to improve passage of fish through the bypasses. Most of the riparian losses would occur at the north end of Yolo Bypass where major fish passage improvements are planned. Excavation to improve water movement in the Toe Drain and in the Sacramento Weir would also remove Swainson's hawk habitat.
- *CM4 Tidal Natural Communities Restoration*: Site preparation and inundation would permanently remove an estimated 37,106 acres (295 acres of breeding habitat, 36,811 acres of foraging habitat) of modeled Swainson's hawk habitat. Impacts to foraging habitat from CM4 would consist of 11,025 acres of very high-value (alfalfa), 4,992 acres of high-value, and 11, 545 acres of moderate-value habitat (See table 12-4-35 for land cover types classified by habitat value). Because the species is highly mobile and wide-ranging, habitat fragmentation is not expected to reduce the use of remaining cultivated lands or preclude access to surrounding lands. However, the conversion of cultivated lands to tidal wetlands over fairly broad areas within the tidal restoration footprints could result in the removal or abandonment of nesting territories that occur within or adjacent to the restoration areas. Depending on the extent and value of remaining habitat, this could reduce the local nesting population. There are at least 27 Swainson's hawk nest sites that overlap with the hypothetical restoration areas for CM4, suggesting that numerous nest sites could be directly affected by inundation from tidal restoration activities.

- *CM5 Seasonally Inundated Floodplain Restoration* and *CM7 Riparian Natural Community Restoration*: Construction of setback levees to restore seasonally inundated floodplain and riparian restoration actions (CM5) would permanently remove approximately 5,840 acres of modeled Swainson's hawk habitat consisting of 38 acres of breeding habitat and 5,802 acres of foraging habitat. In addition, levee construction and restoration actions would temporarily remove approximately 1,059 acres of modeled Swainson's hawk habitat consisting of 31 acres of modeled breeding habitat, and 1,028 acres of modeled foraging habitat. Based on the riparian habitat restoration assumptions (CM7), of the 5,000 acres of valley/foothill riparian habitat restored, a minimum of 3,000 acres would be restored as a component of seasonally inundated floodplain restoration actions.
- *CM6 Channel Margin Enhancement*: Construction-related activities for channel margin enhancement would be located along levees that do not presently support Swainson's hawk habitat. Approximately 37 acres of valley/foothill riparian habitat are expected to be restored as a component of channel margin enhancement actions along 20 miles of river and slough channels in the Delta. Another 37 acres of riparian habitat would be restored if 20 more miles of channel margin are enhanced under adaptive management. Some of the riparian habitat to be restored as part of channel margin enhancement is expected to support nesting habitat for Swainson's hawk.
- *CM8 Grassland Natural Community Restoration*: Restoration of grassland is expected to be implemented on agricultural lands and would result in the conversion of 1,849 acres of Swainson's hawk agricultural foraging habitat to grassland foraging habitat in CZ 1, CZ 8, and/or CZ 11. If agricultural lands supporting higher value foraging habitat than the restored grassland were removed, there would be a loss of Swainson's hawk foraging habitat value.
- *CM10 Nontidal Marsh Restoration*: Restoration and creation of nontidal freshwater marsh would result in the permanent removal of 1,440 acres of Swainson's hawk foraging habitat in CZ 2 and CZ 4. Small patches of riparian vegetation that support Swainson's hawk nesting habitat may develop along the margins of restored nontidal marsh if appropriate site conditions are present.
- *CM11 Natural Communities Enhancement and Management:* Habitat management- and enhancement-related activities could disturb Swainson's hawk nests if they were present near work sites. A variety of habitat management actions that are designed to enhance wildlife values in BDCP-protected habitats may result in localized ground disturbances that could temporarily remove small amounts of Swainson's hawk habitat and reduce the functions of habitat until restoration is complete. Ground-disturbing activities, such as removal of nonnative vegetation and road and other infrastructure maintenance, are expected to have minor effects on available Swainson's hawk habitat and are expected to result in overall improvements to and maintenance of habitat values over the term of the BDCP. These effects cannot be quantified, but are expected to be minimal and would be avoided and minimized by the AMMs listed below.
- *CM18 Conservation Hatcheries*: Construction for conservation hatcheries could result in the permanent removal of 35 acres of foraging grassland habitat for Swainson's hawk in the Yolo Bypass area (CZ 2). The specifications and operations of this facility have not been developed, nor has the facility location been specifically determined, although it is expected to be located within the study area in the vicinity of Rio Vista.
- Permanent and temporary habitat losses from the above conservation measures, would primarily consist of small, fragmented riparian stands in CZ 2, CZ 3, CZ 4, CZ 5, CZ 6, CZ 7, and CZ 8. Temporarily affected areas would be restored as riparian habitat within 1 year following

completion of construction activities. Although the effects are considered temporary, the restored riparian habitat would require 1 to several decades to functionally replace habitat that has been affected and for trees to attain sufficient size and structure suitable for nesting by Swainson's hawks. The restored riparian habitats would be designed to provide future nesting habitat in large contiguous patches over the term of the BDCP in order to increase nesting opportunities for the species. The functions of agricultural and grassland communities that provide foraging habitat for Swainson's hawk are expected to be restored relatively quickly.

- Operations and Maintenance: Postconstruction operation and maintenance of the above-ground water conveyance facilities and restoration infrastructure could result in ongoing but periodic disturbances that could affect Swainson's hawk use of the surrounding habitat. Maintenance activities would include vegetation management, levee and structure repair, and re-grading of roads and permanent work areas. These effects, however, would be reduced by AMMs and conservation actions as described below.
- Injury and Direct Mortality: Construction-related activities would not be expected to result in direct mortality of adult or fledged Swainson's hawk if they were present in the Plan Area, because they would be expected to avoid contact with construction and other equipment. However, if Swainson's hawk were to nest in the construction area, construction-related activities, including equipment operation, noise and visual disturbances could affect nests or lead to their abandonment, potentially resulting in mortality of eggs and nestlings. These effects would be avoided and minimized with the incorporation of *AMM18 Swainson's Hawk and White-Tailed Kite* into the BDCP.

The following paragraphs summarize the combined effects discussed above and describe other BDCP conservation actions that offset or avoid these effects. NEPA and CEQA impact conclusions are also included.

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection and/or restoration in an appropriate timeframe to ensure that the effect of construction would not be adverse under NEPA. The Plan would remove 505 acres of breeding habitat and 13,995 acres of foraging habitat for Swainson's hawk in the study area in the near-term. These effects would result from the construction of the water conveyance facilities (CM1, 26 acres of breeding and 4,993 acres of foraging habitat), and implementing other conservation measures (Yolo Bypass Fisheries Enhancement [CM2], Tidal Natural Communities Restoration [CM4], Seasonally Inundated Floodplain Restoration [CM5], Grassland Natural Community Restoration [CM8], Nontidal Marsh Restoration [CM10], Conservation Hatcheries [CM18], 479 acres of breeding and 9,002 acres of foraging habitat).

Typical NEPA and CEQA project-level mitigation ratios for those natural communities affected by CM1 and that are identified in the biological goals and objectives for Swainson's hawk in Chapter 3 of the BDCP would be 1:1 for restoration/creation and 1:1 protection of valley/foothill riparian habitat for breeding habitat, and 0:1 for restoration/creation and 1:1 protection for foraging habitat. Using these typical ratios would indicate that 26 acres of breeding habitat should be restored/created and 26 acres should be protected to mitigate for the CM1 losses of Swainson's hawk breeding habitat. In addition, 4,993 acres of foraging habitat should be protected to mitigate for the CM1 losses of Swainson's hawk foraging habitat. The offsetting acreage would need to be 34 acres each of restoration and protection of breeding habitat, and 4,252 acres of protection of foraging habitat if the east-west transmission line alignment was selected for Alternative 4. There are several extant occurrences of Swainson's hawk in the vicinity of the east-west transmission line, and if selected, this alignment could adversely affect individuals through bird-strike, particularly young birds. The near-term effects of other conservation actions would remove 479 acres of modeled breeding habitat, and therefore require 479 acres of restoration and 479 acres of protection of breeding habitat. Similarly, the near-term effects of other conservation actions would remove 9,002 acres of modeled foraging habitat, and therefore require 9,002 acres of protection of foraging habitat using the same typical NEPA and CEQA ratios (1:1 for restoration and 1:1 for protection of breeding habitat; 0:1 for restoration and 1:1 for protection of foraging habitat).

The BDCP has committed to near-term goals of protecting 750 acres and restoring 800 acres of the valley/foothill riparian natural community. Temporarily disturbed nesting habitat would be restored following the completion of construction. In addition, 17,120 acres of natural communities that comprise foraging habitat would be protected and 1,238 acres would be restored in the near-term and much of this habitat would be expected to benefit the Swainson's hawk. Riparian restoration actions through CM7 and CM11 would expand the patches of existing riparian forest in order to support nesting habitat for the species. The restoration of a large contiguous mosaic of grassland, vernal pool complex, and alkali seasonal wetlands would provide important foraging habitat for the species. The Plan's species-specific biological goals and objectives specify that through *CM11 Natural Communities Enhancement and Management*, small but essential habitats for Swainson's hawk that occur within cultivated lands, such as tree rows along field borders or roads, or small clusters of trees in farmyards or rural residences would be protected. In addition, the distribution and abundance of potential Swainson's hawk nest trees would be increased by planting and maintaining native trees along roadsides and field borders within protected cultivated lands at a rate of one tree per 10 acres. Foraging opportunities would also be improved by enhancing prey populations through the establishment of 20- to 30-foot-wide hedgerows along field borders and roadsides within protected cultivated lands at a minimum rate of 400 linear feet per 100 acres. The biological goals and objectives for Swainson's hawk further specify that at least 1 acre of Swainson's hawk foraging habitat would be conserved for each acres of lost foraging habitat. In addition, at least 36,735 acres of Swainson's hawk foraging habitat would be protected within of the 45,405 acres of cultivated lands protected by the late long-term, 50% of which would be in very high-value habitat production in CZ 1, CZ 2, CZ 3, CZ 4, CZ 7, CZ 8, CZ 9, and CZ 11. These biological goals and objectives would inform the near-term protection and restoration efforts and represent performance standards for considering the effectiveness of restoration actions.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training*, *AMM2 Construction Best Management Practices and Monitoring*, *AMM3 Stormwater Pollution Prevention Plan*, *AMM4 Erosion and Sediment Control Plan*, *AMM5 Spill Prevention, Containment, and Countermeasure Plan*, *AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan*, *AMM7 Barge Operations Plan*, and *AMM18 Swainson's Hawk and White-Tailed Kite*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas and disposal sites. The AMMs are described in detail in BDCP Appendix 3.C.

The near-term loss of 505 acres of nesting habitat would not have an adverse effect on the species because the impacted habitat is primarily lower value habitat and Swainson's hawks would persist in other nesting habitat available within the study area until restored nesting habitat becomes functional. A large proportion of the 505 acres of nesting habitat that would be impacted consists of sparsely distributed trees within grasslands, and the actual loss of suitable nesting trees would be expected to be low. In addition, approximately 173 acres of this nesting habitat would be impacted as a result of *CM4 Tidal Natural Communities Restoration*. Trees would not be actively removed but tree mortality would be expected over time as areas became tidally inundated. Restoration projects under CM4 would be prioritized in areas where tidal habitat restoration would not adversely affect mature riparian stands and Swainson's hawk nest trees in the near-term time period.

The 750 acres of protection contained in the near-term Plan goals satisfy the typical mitigation ratios that would be applied to the project-level effects of CM1 on Swainson's hawk nesting and foraging habitat. The 800 acres of restored riparian habitat would be initiated in the near-term to offset the loss of 505 acres of modeled habitat, but would require 1 to several decades to functionally replace habitat that has been affected and for trees to attain sufficient size and structure suitable for nesting by Swainson's hawks. This time lag between the removal and restoration of nesting habitat could have a substantial impact on Swainson's hawk in the near-term time period. AMM18 would reduce the impact of near-term loss of nesting habitat by requiring a) 15 5-gallon trees be planted for every nest tree (a tree with a nest having been active within the last 5 years) expected to be lost, and b) three 5-gallon trees be planted for each potential nest tree (i.e., trees that are large enough to provide potential habitat) expected to be removed during the near-term period. Trees would be planted in clumps of at least three on cultivated lands as part of CM11 or would be incorporated into riparian restoration under CM7. To further offset near-term impacts, under AMM18, a variety of native tree species with differing growth rates would be planted. This variety would ensure that nesting habitat is available quickly (approximately 10 years for cottonwoods and willows) and in the longer term (valley oaks, black walnuts, and sycamores). Replacement trees would be planted in areas that are within 5 miles of known current or historic Swainson's hawk nest locations. Nesting tree replacement planting would occur within 18 months of Plan approval and a monitoring and maintenance plan described in CM11 would ensure the establishment and survival of planted trees. For all of these reasons, Alternative 4 would not have a substantial adverse effect on Swainson's hawk in the near-term timeframe, either through direct mortality or through habitat modifications.

Late Long-Term Timeframe

The study area supports approximately 10,248 acres of modeled breeding habitat and 460,214 acres of modeled foraging habitat for Swainson's hawk. Alternative 4 as a whole would result in the permanent loss of and temporary effects on 696 acres of potential breeding habitat (7% of the potential breeding habitat in the study area) and 53,330 acres of foraging habitat (12% of the foraging habitat in the study area).

The Plan includes a commitment to restore or create at least 5,000 acres in CZ 4 and/or CZ 7 and protect at least 750 acres of valley/foothill riparian woodland in CZ 7. In addition, The Plan would restore or create at least 2,000 acres of grassland in CZ 1, 8, and 11 protect 8,000 acres of grassland (with at least 2,000 acres protected in CZ 1, at least 1,000 acres in CZ 8, at least 2,000 acres protected in CZ 11, and the remainder distributed throughout CZ 1, 2, 4, 5, 7, 8, and 11 in the study area. 72 acres of alkali seasonal wetland and 67 acres of vernal pool natural communities would be restored and 150 acres of alkali seasonal wetland and 600 acres of vernal pool natural communities would be protected. Finally, 40,010 acres of cultivated lands would also be protected (Table 12-4-34). The protection and restoration of nesting habitat is essential for the conservation of Swainson's hawk in the Plan Area. Riparian restoration actions through CM7 and CM11 would expand the patches of existing riparian forest in order to support nesting habitat for the species. Although the Swainson's hawk is reliant on cultivated lands, the restoration of a large contiguous mosaic of grassland, vernal pool complex, and alkali seasonal wetlands would provide important foraging habitat for the species.

To ensure further conservation of breeding and foraging habitat for Swainson's hawk, the Plan's species specific biological goals and objectives (BDCP, Chapter 3) further specify that through *CM11 Natural Communities Enhancement and Management*, small, but essential habitats for Swainson's hawk that occur within cultivated lands, such as tree rows along field borders or roads, or small clusters of trees in farmyards or rural residences would be protected. In addition, the distribution and abundance of potential Swainson's hawk nest trees would be increased by planting and maintaining native trees along roadsides and field borders within protected cultivated lands at a rate of one tree per 10 acres. Foraging opportunities would also be enhanced on cultivated lands by enhancing prey populations through the establishment of 20 to 30 foot wide hedgerows along field borders and roadsides within protected cultivated lands at a minimum rate of 400 linear feet per 100 acres. The biological goals and objectives for Swainson's hawk further specify that at least 1 acre of Swainson's hawk foraging habitat would be conserved for each acres of lost foraging habitat. In addition, at least 36,735 acres of Swainson's hawk foraging habitat would be protected within of the 45,405 acres of cultivated lands protected by the late long-term, 50% of which would be in very high-value habitat production in CZ 1, CZ 2, CZ 3, CZ 4, CZ 7, CZ 8, CZ 9, and CZ 11.

The loss of Swainson's hawk habitat associated with Alternative 4 would represent an adverse effect as a result of habitat modification of a special-status species and potential for direct mortality in the absence of other conservation actions. With habitat protection and restoration associated with CM3, CM5, CM7, CM8, CM9, and CM11, guided by biological goals and objectives and AMM1–AMM7 and AMM18, which would be in place throughout the time period any construction activity would be occurring, the effects of habitat loss and potential mortality under Alternative 4 on Swainson's hawk would not be adverse under NEPA.

CEQA Conclusion: Alternative 4 (CM1–CM18) would have both temporary and permanent impacts on Swainson's hawk and their modeled habitat and operation of construction equipment could injure or disturb individuals, if present in the study area.

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection and/or restoration in an appropriate timeframe to ensure that the impacts of construction would be less than significant under CEQA. The Plan would remove 505 acres of breeding habitat and 13,995 acres of foraging habitat for Swainson's hawk in the study area in the near-term. These impacts would result from the construction of the water conveyance facilities (CM1, 26 acres of breeding and 4,993 acres of foraging habitat), and implementing other conservation measures (Yolo Bypass Fisheries Enhancement [CM2], Tidal Natural Communities Restoration [CM4], Seasonally Inundated Floodplain Restoration [CM5], Grassland Natural Community Restoration [CM8], Nontidal Marsh Restoration [CM10], Conservation Hatcheries [CM18], 479 acres of breeding and 9,002 acres of foraging habitat).

Typical NEPA and CEQA project-level mitigation ratios for those natural communities impacted by CM1 and that are identified in the biological goals and objectives for Swainson's hawk in Chapter 3 of the BDCP would be 1:1 for restoration/creation and 1:1 protection of valley/foothill riparian habitat for breeding habitat, and 0:1 for restoration/creation and 1:1 protection for foraging habitat. Using these typical ratios would indicate that 26 acres of breeding habitat should be restored/created and 26 acres should be protected to mitigate for the CM1 losses of Swainson's hawk breeding habitat. In addition, 4,993 acres of foraging habitat should be protected to mitigate for the CM1 losses of Swainson's hawk foraging habitat. The offsetting acreage would need to be 34 acres each of restoration and protection of breeding habitat, and 4,252 acres of protection of foraging habitat if the east-west transmission line alignment was selected for Alternative 4. There are several extant occurrences of SWHA in the vicinity of the E-W transmission line, and if selected, this alignment could adversely affect individuals through bird-strike, particularly young birds. The near-term impacts of other conservation actions would remove 479 acres of modeled breeding habitat, and therefore require 479 acres of restoration and 479 acres of protection of breeding habitat. Similarly, the near-term impacts of other conservation actions would remove 9,002 acres of modeled foraging habitat, and therefore require 9,002 acres of protection of foraging habitat using the same typical NEPA and CEQA ratios (1:1 for restoration and 1:1 for protection of breeding habitat; 0:1 for restoration and 1:1 for protection of foraging habitat).

The BDCP has committed to near-term goals of protecting 750 acres and restoring 800 acres of the valley/foothill riparian natural community. Temporarily disturbed nesting habitat would be restored following the completion of construction. In addition, 17,120 acres of natural communities that comprise foraging habitat would be protected and 1,238 acres would be restored in the near-term and much of this habitat would be expected to benefit the Swainson's hawk. The protection and restoration of nesting habitat is essential for the conservation of Swainson's hawk in the Plan Area. Riparian restoration actions through CM7 and CM11 would expand the patches of existing riparian forest in order to support nesting habitat for the species. The restoration of a large contiguous mosaic of grassland, vernal pool complex, and alkali seasonal wetlands would provide important foraging habitat for the species. The Plan's species-specific biological goals and objectives specify that through *CM11 Natural Communities Enhancement and Management* small but essential habitats for Swainson's hawk that occur within cultivated lands, such as tree rows along field borders or roads, or small clusters of trees in farmyards or rural residences, would be protected. In addition, the distribution and abundance of potential Swainson's hawk nest trees would be increased by planting and maintaining native trees along roadsides and field borders within protected cultivated lands at a rate of one tree per 10 acres. Foraging opportunities would also be improved by enhancing prey populations through the establishment of 20- to 30-foot-wide hedgerows along field borders and roadsides within protected cultivated lands at a minimum rate of 400 linear feet per 100 acres. The biological goals and objectives for Swainson's hawk further specify that at least 1 acre of Swainson's hawk foraging habitat would be conserved for each acre of lost foraging habitat. In addition, at least 36,735 acres of Swainson's hawk foraging habitat would be protected within the 45,405 acres of cultivated lands protected by the late long-term, 50% of which would be in very high-value habitat production in CZ 1, CZ 2, CZ 3, CZ 4, CZ 7, CZ 8, CZ 9, and CZ 11. These biological goals and objectives would inform the near-term protection and restoration efforts and represent performance standards for considering the effectiveness of restoration actions.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training*, *AMM2 Construction Best Management Practices and Monitoring, AMM3 Stormwater Pollution Prevention Plan*, *AMM4 Erosion and Sediment Control Plan*, *AMM5 Spill Prevention, Containment, and Countermeasure Plan*, *AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan*, *AMM7 Barge Operations Plan*, and *AMM18 Swainson's Hawk and White-Tailed Kite*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas and disposal sites. The AMMs are described in detail in BDCP Appendix 3.C.

The near-term loss of 505 acres of nesting habitat would not be expected to have a significant impact on the species because the impacted habitat is primarily lower value habitat and Swainson's hawks would persist in other nesting habitat available within the study area until restored nesting habitat becomes functional. A large proportion of the 505 acres of nesting habitat that would be impacted consists of sparsely distributed trees within grasslands, and the actual loss of suitable nesting trees would be expected to be low. In addition, approximately 173 acres of this nesting habitat would be impacted as a result of *CM4 Tidal Natural Communities Restoration*. Trees would not be actively removed but tree mortality would be expected over time as areas became tidally inundated. Restoration projects under CM4 would be prioritized in areas where tidal habitat restoration would not adversely affect mature riparian stands and Swainson's hawk nest trees in the near-term time period.

The 750 acres of protection contained in the near-term Plan goals satisfy the typical mitigation ratios that would be applied to the project-level effects of CM1 on Swainson's hawk nesting and foraging habitat. The 800 acres of restored riparian habitat would be initiated in the near-term to offset the loss of 505 acres of modeled nesting habitat, but would require 1 to several decades to functionally replace habitat that has been affected and for trees to attain sufficient size and structure suitable for nesting by Swainson's hawks. This time lag between the removal and restoration of nesting habitat could have a substantial impact on Swainson's hawk in the near-term time period. AMM18 would reduce the impact of near-term loss of nesting habitat by requiring a) 15 5-gallon trees be planted for every nest tree (a tree with a nest having been active within the last 5 years) expected to be lost, and b) three 5-gallon trees be planted for potential nest trees (i.e., trees that are large enough to provide potential habitat) expected to be removed during the near-term period. Trees would be planted in clumps of at least three on cultivated lands as part of CM11 or would be incorporated into riparian restoration under CM7. To further offset near-term impacts, under AMM18, a variety of native tree species would be planted to provide trees with differing growth rates. This variety would ensure that nesting habitat is available quickly (approximately 10 years for cottonwoods and willows) and in the longer term (valley oaks, black walnuts, and sycamores). Replacement trees would be planted in areas that are within 5 miles of known current or historic Swainson's hawk nest locations. Nesting tree replacement planting would occur within 18 months of Plan approval and a monitoring and maintenance plan described in CM11 would ensure the establishment and survival of planted trees. For all of these reasons, Alternative 4 would not have a substantial adverse effect on Swainson's hawks in the near-term timeframe, either through direct mortality or through habitat modifications. The impact would be less than significant.

Late Long-Term Timeframe

The study area supports approximately 10,248 acres of modeled breeding habitat and 460,214 acres of modeled foraging habitat for Swainson's hawk. Alternative 4 as a whole would result in the permanent loss of and temporary effects on 696 acres of potential breeding habitat (7% of the potential breeding habitat in the study area) and 53,330 acres of foraging habitat (12% of the foraging habitat in the study area). The Plan includes a commitment to restore or create at least 5,000 acres in CZ 4 and/or CZ 7 and protect at least 750 acres of valley/foothill riparian woodland in CZ 7. In addition, The Plan would restore or create at least 2,000 acres of grassland in CZ 1, 8 and 11 protect 8,000 acres of grassland (with at least 2,000 acres protected in CZ 1, at least 1,000 acres in CZ 8, at least 2,000 acres protected in CZ 11, and the remainder distributed throughout CZs 1, 2, 4, 5, 7, 8, and 11 in the study area. A total of 72 acres of alkali seasonal wetland and 67 acres of vernal pool natural communities would be restored and 150 acres of alkali seasonal wetland and 600 acres of vernal pool natural communities would be protected. Finally, 40,010 acres of cultivated lands would also be protected (Table 12-4-34).

The protection and restoration of nesting habitat is essential for the conservation of Swainson's hawk in the Plan Area. Riparian restoration actions through CM7 and CM11 would expand the patches of existing riparian forest in order to support nesting habitat for the species. Although the Swainson's hawk is reliant on cultivated lands, the restoration of a large contiguous mosaic of grassland, vernal pool complex, and alkali seasonal wetlands would provide important foraging habitat for the species. To ensure further conservation of breeding and foraging habitat for Swainson's hawk, the Plan's species specific biological goals and objectives further specify that through *CM11 Natural Communities Enhancement and Management*, small but essential habitats for Swainson's hawk that occur within cultivated lands, such as tree rows along field borders or roads, or small clusters of trees in farmyards or rural residences would be protected. In addition, the distribution and abundance of potential Swainson's hawk nest trees would be increased by planting and maintaining native trees along roadsides and field borders within protected cultivated lands at a rate of one tree per 10 acres. Foraging opportunities would also be enhanced on cultivated lands by enhancing prey populations through the establishment of 20- to 30-foot-wide hedgerows along field borders and roadsides within protected cultivated lands at a minimum rate of 400 linear feet per 100 acres. The biological goals and objectives for Swainson's hawk further specify that at least 1 acre of Swainson's hawk foraging habitat would be conserved for each acres of lost foraging habitat. In addition, at least 36,735 acres of Swainson's hawk foraging habitat would be protected within of the 45,405 acres of cultivated lands protected by the late long-term, 50% of which would be in very high-value habitat production in CZ 1, 2, 3, 4, 7, 8, 9, and 11.

Considering these protection and restoration provisions, which would provide acreages of new or enhanced habitat in amounts greater than necessary to compensate for the time lag of restoring riparian and foraging habitats lost to construction and restoration activities, and implementation of AMM1–AMM7, and AMM18, the loss of habitat or direct mortality through implementation of Alternative 4 would not result in a substantial adverse effect through habitat modifications and would not substantially reduce the number or restrict the range of the species. Therefore, the loss of habitat or potential mortality under this alternative would have a less-than-significant impact on Swainson's hawk.

Impact BIO-84: Effects on Swainson's hawk associated with electrical transmission facilities

New transmission lines would increase the risk that Swainson's hawks could be subject to power line strikes, which could result in injury or mortality of Swainson's hawks. This species would be at low risk of bird strike mortality based on factors assessed in the bird strike vulnerability analysis (BDCP Attachment 5.J-2, *Memorandum: Analysis of Potential Bird Collisions at Proposed BDCP Transmission Lines*). Factors analyzed include the height of the new transmission lines and the flight behavior of the species. The existing network of transmission lines in the Plan Area currently poses the same small risk for Swainson's hawk, and any incremental risk associated with the new power line corridors would also be expected to be low. *AMM20 Greater Sandhill Crane,* would further reduce any potential adverse effects.

CEQA Conclusion: New transmission lines would minimally increase the risk for Swainson's hawk power line strikes. *AMM20 Greater Sandhill Crane*, would reduce the potential impact of the construction of new transmission lines on Swainson's hawk to a less-than-significant level.

Impact BIO-85: Effects of noise and visual disturbance on Swainson's hawk

Construction-related noise and visual disturbances outside the project footprint but within 600 feet of construction activities are indirect effects that could temporarily affect the use of 1,003 acres (less than 1%) of modeled Swainson's hawk habitat. These construction activities would include water conveyance construction, tidal restoration activities, floodplain restoration, and Fremont Weir/Yolo Bypass Enhancements.

Swainson's hawks are seasonally abundant across much of the Plan Area wherever adequate nest trees occur within a cultivated landscape that supports suitable foraging habitat. There would be a potential for noise and visual disturbances associated with BDCP actions to temporarily displace Swainson's hawks and temporarily reduce the use of suitable habitat adjacent to construction areas. Assuming effects up to 0.25 mile from the edge of construction to nest sites and up to 600 feet for foraging birds, noise and visual disturbances could temporarily affect the use of up to 1,003 acres of foraging habitat for Swainson's hawk. These adverse effects would be minimized with the implementation of *AMM18 Swainson's Hawk and White-Tailed Kite*.

CEQA Conclusion: Noise and visual disturbances from the construction of water conveyance facilities could reduce Swainson's hawk use of modeled habitat adjacent to work areas. Moreover, operation and maintenance of the water conveyance facilities, including the transmission facilities, could result in ongoing but periodic post construction disturbances that could affect Swainson's hawk use of the surrounding habitat. However, *AMM18 Swainson's Hawk and White-Tailed Kite* would ensure that potential impacts on nesting Swainson's hawk would be less than significant.

Impact BIO-86: Periodic effects of inundation of Swainson's hawk nesting and foraging habitat as a result of implementation of conservation components

Fremont Weir/Yolo Bypass Improvements: Periodic inundation could affect Swainson's hawks occupying areas ranging from an estimated 3,144 acres to 6,645. The inundation could affect Swainson's hawk in 3,100 to 6,579 acres of foraging habitat and 39 to 67 acres of nesting habitat (Table 12-4-34). However, project-associated inundation of areas that would not otherwise have been inundated would be expected to occur in no more than 30% of all years, since Fremont Weir is expected to overtop the remaining estimated 70% of all years, and during those years notch operations would not typically affect the maximum extent of inundation. In more than half of all years under existing conditions, an area greater than the project-related inundation area already inundates in the bypass. Therefore, habitat conditions in the bypass would not be expected to change substantially as a result of Yolo Bypass operations. However, increased duration of inundation during years of Fremont Weir operation, may delay the period for which foraging habitat is available to Swainson's hawks by up to several weeks.

Floodplain Restoration: This activity would periodically inundate an estimated 8,027 acres of modeled Swainson's hawk foraging and 188 acres of nesting habitat (Table 12-4-34). Floodplain restoration would be expected to restore a more natural flood regime and sustain riparian vegetation types that support regeneration of Swainson's hawk nesting habitat. The restored floodplains would transition from areas that flood frequently (e.g., every 1 to 2 years) to areas that flood infrequently (e.g., every 10 years or more).

Foraging habitat that is inundated after Swainson's hawks arrive in the Central Valley in mid-March could result in a periodic loss of available foraging habitat due to the reduction in available prey. Inundated habitats would be expected to recover following draw-down and provide suitable foraging conditions until the following inundation period. Thus, this is considered a periodic and short term effect that is unlikely to affect Swainson's hawk distribution and abundance, or foraging use of the Plan Area and therefore have a less than adverse effect on the species.

CEQA Conclusion: Increased periodic flooding would not be expected to cause any adverse effect on nest sites because trees in which nest sites are situated already withstand floods, the increase in inundation frequency and duration is expected to remain within the range of tolerance of riparian trees, and nest sites are located above floodwaters. Although foraging habitat would be periodically unavailable to Swainson's hawk, inundated habitats are expected to recover following draw down. This would be considered a short-term effect that is unlikely to have a significant impact on Swainson's hawk.

Tricolored Blackbird

The habitat model used to assess effects for tricolored blackbird is based on breeding habitat and nonbreeding habitat. Although nesting colonies have been documented along the fringe of Suisun Marsh, in the Yolo Bypass and along the southwestern perimeter of the Plan Area, breeding colonies are uncommon in the Plan Area. Modeled breeding habitat includes bulrush/cattail wetlands and shrub communities that may provide suitable nesting substrate, and adjacent high-value foraging areas that occur within 5 miles of nesting colonies documented in the Plan Area. The foraging component includes cultivated lands and noncultivated land cover types known to support abundant insect populations such as grasslands, pasturelands (including alfalfa), natural seasonal wetlands, and sunflower croplands. The Delta is recognized as a major wintering area for tricolored blackbird (Hamilton 2004, Beedy 2008). Modeled nonbreeding habitat includes emergent wetlands and shrub stands that provide suitable roosting habitat, as well as cultivated lands and noncultivated lands that provide foods sought by tricolored blackbirds during the winter. Outside of the breeding season, tricolored blackbirds are primarily granivores that forage opportunistically across the Plan Area in grasslands, pasturelands, croplands, dairies, and livestock feed lots. Factors considered in assessing the value of affected habitat for the tricolored blackbird, include patch size, suitability of vegetation, and proximity to recorded occurrences.

Construction and restoration associated with Alternative 4 conservation measures would result in both temporary and permanent losses of tricolored blackbird modeled habitat as indicated in Table 12-4-36. Full implementation of Alternative 4 would restore or create 72 acres and protect 150 acres of alkali seasonal wetland; restore or create 2,000 acres and protect 8,000 acres of grassland; restore or create 67 acres and protect 600 acres of vernal pool complex. In addition, up to 55,000 acres of tidal natural communities would be restored and 45,405 acres of cultivated lands would be protected (Table 12-4-36). As explained below, with the restoration or protection of these amounts of habitat, impacts on tricolored blackbird would not be adverse for NEPA purposes and would be less than significant for CEQA purposes.

Table 12-4-36. Changes to Tricolored Modeled Habitat Associated with Alternative 4 (acres)[a]

	Conservation Measure[b]	Habitat Type	Permanent		Temporary		Periodic[d]	
			NT	LLT	NT	LLT	Yolo	Floodplain
Habitat Affected[c]	CM1	Breeding	697	697	258	258	NA	NA
		Non-breeding	1,765	1,765	522	522	NA	NA
	Total Impacts CM1		**2,462**	**2,462**	**780**	**780**		
	CM2–CM18						2,665–4,	

	Breeding			246		767	
	Non-breeding	3,315	14,383	28	375	267–1,180	2,574
	Total Impacts CM2–CM18	**5,458**	**24,601**	**274**	**873**	**2,932–5,947**	**4,567**
	TOTAL IMPACTS	**7,920**	**27,063**	**1,054**	**1,653**	**2,932–5,947**	**4,567**
	CM3 alkali seasonal wetland	58	72	NA	NA	NA	NA
	CM4 tidal wetland	13,800	55,000	NA	NA	NA	NA
	CM8 grassland	1,140	2,000	NA	NA	NA	NA
	CM9 vernal pool	40	67	NA	NA	NA	NA
	Total Restoration/Creation	15,038	**57,139**				
Habitat Protected[e]	CM3 grassland	2,000	8,000	NA	NA	NA	NA
	CM3 alkali seasonal wetland	120	150	NA	NA	NA	NA
	CM3 vernal pool complex	400	600	NA	NA	NA	NA
	CM3 cultivated lands (nonrice)	14,600	45,405	NA	NA	NA	NA
	Total Protection	17,120	**54,155**				

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late long-term timeframes.

[b] See discussion below for a description of applicable CMs.

[c] LLT acreages are a summation of effects that would occur in the near-term, early long-term and late long-term timeframes. The LLT acreages represent the total amount of habitat that would be affected over the 50-year life of the BDCP and do not reflect habitat increases that would result from restoration, creation and protection activities.

[d] Periodic effects were estimated for the late long-term only. Yolo periodic impacts are presented as a range based on different flow regimes at the proposed notch in Fremont Weir.

[e] Restored/created and protected habitat acreages represent planned conservation activities that would be implemented over the lifetime of the BDCP (see BDCP Chapter 3, *Conservation Strategy*, for specifics).

NT = near-term

LLT = late long-term

NA = not applicable

Impact BIO-87: Loss or conversion of habitat for and direct mortality of tricolored blackbird

Alternative 4 conservation measures would result in the permanent and temporary loss combined of up to 11,671 acres of modeled breeding habitat and up to 17,045 acres of modeled nonbreeding for tricolored blackbird (Table 12-4-36). Conservation measures that would result in these losses are conveyance facilities and transmission line construction, and establishment and use of borrow and spoil areas from Water Facilities and Operation (CM1), Yolo Bypass Fisheries Enhancements (CM2), Tidal Natural Communities Restoration (CM4), Seasonally Inundated Floodplain Restoration (CM5), Nontidal Marsh Restoration (CM10) and Conservation Hatcheries (CM18). Habitat enhancement and management activities (CM11), which include ground disturbance or removal of nonnative vegetation, could result in local adverse habitat effects. In addition, maintenance activities associated with the long-term operation of the water conveyance facilities and other BDCP physical facilities could degrade or eliminate tricolored blackbird habitat. Each of these individual activities is described below. A summary statement of the combined impacts and NEPA and CEQA conclusions follows the individual conservation measure discussions.

- *CM1 Water Facilities and Operation*: Construction of Alternative 4 conveyance facilities would result in the combined permanent and temporary loss of approximately 3,242 acres of modeled tricolored blackbird habitat, composed of 955 acres of breeding habitat and 2,287 acres of nonbreeding habitat (Table 12-4-36). The 955 acres of breeding habitat that would be removed for the construction of the conveyance facilities consists of 11 acres of nesting, 555 acres of cultivated, and 389 acres of noncultivated lands suitable for foraging. The 2,287 acres of nonbreeding habitat that would be removed from CM1 consists of 32 acres of roosting, 2,081 acres of cultivated lands, and 174 acres of noncultivated lands suitable for foraging. Most of the habitat that would be lost is located in the central Delta, from CZs 3-6 and CZ 8. Refer to the Terrestrial Biology Map Book for a detailed view of Alternative 4 construction locations.

  There would be a 116 acre decrease in the combined permanent and temporary losses of tricolored blackbird modeled habitat associated with the construction of the east-west transmission line for the Alternative 4 water conveyance facility rather than the north-south transmission line. This difference in acreage would be a 5 acres decrease in the loss of breeding habitat and a 111 acre decrease in the loss of non-breeding habitat for the species.

- *CM2 Yolo Bypass Fisheries Enhancement*: Construction activity associated with fisheries improvements in the Yolo Bypass would result in the permanent removal of approximately 607 acres of breeding habitat (17 acres of nesting, 445 acres of cultivated lands and 146 acres of noncultivated habitats suitable for foraging) and 182 acres of nonbreeding habitat (11 acres of roosting, 171 acres of noncultivated habitats suitable for foraging) for tricolored blackbird in CZ 2. There would be temporary effects on 246 acres of breeding habitat (85 acres of nesting, 1 acres of cultivated lands and 160 acres of noncultivated habitats suitable for foraging) and 28 acres of nonbreeding habitat (2 acres of roosting, 27 acres of noncultivated habitats suitable for foraging) associated with improvements in the Yolo Bypass.

- *CM4 Tidal Natural Communities Restoration*: Tidal natural communities restoration would result in the inundation of approximately 6,598 acres of tricolored blackbird breeding habitat (56 acres of nesting, 4,692 acres of cultivated lands and 1,850 acres of noncultivated habitats suitable for foraging) and 18,227 acres of nonbreeding habitat (1,604 acres of roosting, 14, 988 acres of cultivated lands, and 1,635 acres of noncultivated habitats suitable for foraging). These habitat losses and conversions would occur in CZs 1, 2, 4, 5, 6, 7, 8, and 11. It is unknown what portion of the 24,825 acres to be tidally inundated would provide nonbreeding season roosting habitat for tricolored blackbirds, as it would depend on the future vegetation density and composition. In addition to these losses, another 18 acres of breeding habitat (7 acres of nesting, 11 acres of noncultivated habitats suitable for foraging) and 953 acres of nonbreeding habitat (all cultivated lands) would be permanently converted to riparian habitat along the upper fringe of the tidal restoration areas. Although considered to be a permanent loss, due to the uncertainty of the quantity of restored suitable habitat, any areas that develop into riparian scrub-shrub could provide suitable nesting and roosting habitat for tricolored blackbird. Tidal restoration actions through CM4 would restore an estimated 3,000 acres of tidal brackish and 13,900 acres of tidal freshwater emergent wetland habitat. Although existing tricolored nesting habitat would be removed, restoration of tidal habitats is expected to benefit tricolored blackbird by increasing the extent of large contiguous patches of its nesting habitat.

- *CM5 Seasonally Inundated Floodplain Restoration*: Levee construction and riparian restoration associated with floodplain restoration in the south Delta (CZ 7) would result in the combined permanent and temporary removal of approximately 4,679 acres of breeding habitat (6 acres of nesting, 4,613 acres of cultivated lands and 77 acres of noncultivated habitats suitable for foraging) and 964 acres of nonbreeding habitat (2 acres of roosting, 955 acres of cultivated lands, and 6 acres of noncultivated habitats suitable for foraging) for tricolored blackbird. Patches of riparian scrub associated with the restoration of approximately 1,000 acres of valley/foothill riparian habitat managed as early- to mid-successional habitats (as a component of CM5) could provide suitable nesting, roosting or foraging habitat for tricolored blackbird by increasing the extent and distribution of riparian habitat within the Plan Area once these restored habitats have developed habitat functions for the species.

- *CM6 Channel Margin Enhancement*: Approximately 37 acres of valley/foothill riparian habitat would be restored as a component of channel margin enhancement actions along 20 miles of river and slough channels in the Delta. Another 37 acres of riparian habitat would be restored if 20 more miles of channel margin were enhanced under adaptive management. Some of the restored riparian habitat in the channel margin would be expected to support nesting or roosting habitat for tricolored blackbird.
- *CM8 Grassland Natural Communities Restoration*: Restoration of grassland is expected to be implemented on cultivated lands and could therefore result in the conversion of 2,000 acres of tricolored blackbird cultivated foraging habitat to 2,000 acres of non-cultivated foraging habitat in CZs 1, 8, and/or 11.
- *CM10 Nontidal Marsh Restoration*: Marsh restoration activities would result in the permanent removal or conversion of approximately 600 acres of tricolored blackbird breeding habitat and 1,513 acres of nonbreeding habitat (all cultivated habitat suitable for foraging). About two-thirds of the restored nontidal marsh would be open water, and the remainder would support emergent wetland vegetation that could provide low-value roosting habitat for tricolored blackbird depending on vegetation density and composition.
- *CM11 Natural Communities Enhancement and Management:* A variety of habitat management actions that are designed to enhance wildlife values in BDCP-protected habitats could result in localized ground disturbances that could temporarily remove small amounts of tricolored blackbird habitat. Ground-disturbing activities, such as removal of nonnative vegetation and road and other infrastructure maintenance, would be expected to have minor effects on available tricolored blackbird habitat and are expected to result in overall improvements to and maintenance of tricolored blackbird habitat values over the term of the BDCP. These effects cannot be quantified, but are expected to be minimal and would be avoided and minimized by the AMMs listed below.
- *CM18 Conservation Hatcheries:* Implementation of CM18 would remove up to 35 acres of tricolored blackbird breeding habitat (all noncultivated habitats suitable for foraging) in CZ 2. The specifications and operations of this facility have not been developed, nor has the facility location been specifically determined, although it is expected to be located within the study area in the vicinity of Rio Vista.
- Operations and Maintenance: Postconstruction operation and maintenance of the above-ground water conveyance facilities and restoration infrastructure could result in ongoing but periodic disturbances that could affect tricolored blackbird use of the surrounding habitat in or adjacent to work areas. Maintenance activities would include vegetation management, levee and structure repair, and re-grading of roads and permanent work areas. These effects, however, would be reduced by AMMs and conservation actions as described below.

- Injury and Direct Mortality: Construction vehicle activity may cause injury or mortality to the tricolored blackbird. Risk would be greatest to eggs and nestlings susceptible to land clearing activities, nest abandonment, or increased exposure to the elements or to predators. Injury to or mortality of adults and fledged juveniles would not be expected as individuals would be expected to avoid contact with construction equipment. Construction activities could temporarily fragment existing tricolored blackbird habitat during grading, filling, contouring, and other initial ground-disturbing operations that could temporarily reduce the extent and functions supported by the affected habitat. These effects would be avoided or minimized with the incorporation of *AMM21 Tricolored Blackbird* into the BDCP.

The following paragraphs summarize the combined effects discussed above and describe other BDCP conservation actions that offset or avoid these effects. NEPA and CEQA impact conclusions are also included.

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the effects of construction would not be adverse under NEPA and would be less than significant under CEQA. The Plan would remove 3,344 acres of breeding habitat and 5,630 acres of nonbreeding habitat for tricolored blackbird in the study area in the near-term. These effects would result from the construction of the water conveyance facilities (CM1, 955 acres of breeding and 2,287 acres of nonbreeding habitat), and implementing other conservation measures (tidal restoration [CM4], Yolo Bypass fisheries improvements [CM2], floodplain restoration [CM5], Nontidal Marsh Restoration [CM10], and Conservation Hatcheries [CM10], 2,389 acres of breeding and 3,343 acres of nonbreeding habitat).

Breeding and nonbreeding habitat for tricolored blackbird include multiple natural communities and typical NEPA and CEQA project-level mitigation ratios would be 1:1 for restoration/creation and 1:1 for protection of these natural communities. Impacts to cultivated lands would be compensated with the protection of cultivated lands at a ratio of 1:1, managed in suitable crop types for the species. Using these typical ratios would indicate that 606 acres of natural communities that benefit tricolored blackbird should be restored and protected (for a total of 1,212 acres), in addition to the protection of 2,636 acres of cultivated lands the near-term to mitigate for the CM1 losses. The offsetting acreage would need to be 624 acres each of restoration and protection of natural communities that benefit tricolored blackbird and the protection of 2,735 acres of suitable cultivated lands if the east-west transmission line alignment was selected for Alternative 4. The near-term effects of other conservation actions would remove 2,389 acres of breeding and 3,343 acres of nonbreeding habitat (4,846 acres of which is cultivated lands), and therefore require 886 acres of restoration and protection of natural communities that benefit tricolored blackbird (for a total of 1,772 acres), in addition to the protection of 4,846 acres of cultivated lands in the near-term time period. using the same typical NEPA and CEQA ratios.

The BDCP has committed to near-term goals of restoring 13,800 acres of tidal wetlands in the study area. In addition, 3,758 acres of grasslands, alkali seasonal wetland and vernal pool natural communities (1,230 acres of restoration, 2,528 acres of protection) would be protected and restored as a contiguous mosaic of these natural communities and 14,600 acres of cultivated lands protection in the near-term would also provide breeding and nonbreeding foraging habitat for the species. The protection and restoration of grassland, alkali seasonal wetland, and vernal pool complex would provide improved foraging opportunities for tricolored blackbirds during both the breeding and nonbreeding season. The conservation lands that lie within a few miles of active nesting colonies would provide high-value foraging areas to support breeding tricolored blackbirds. In addition, through CM3 and CM11, the protected matrix of grassland, vernal pool complex, and alkali seasonal wetland would be managed to increase insect prey through techniques such as grazing practices and avoiding the use of pesticides.

These conservation actions would occur in the same timeframe as the construction and early restoration losses, thereby avoiding adverse effects on tricolored blackbird. To ensure that natural community conservation benefits tricolored blackbird, the Plan's biological goals and objectives (BDCP, Chapter 3) further specify that cultivated lands protected for tricolored blackbird retain residual wetland, grassland patches, shrub stands, and herbaceous edge habitats which may provide suitable nesting, foraging or roosting habitat for the species. Species specific biological goals and objectives for tricolored blackbird with Plan implementation, commit to protecting or restoring at least 50 acres of occupied or recently occupied (within the last 15 years) tricolored blackbird nesting habitat located within 5 miles of high-value foraging habitat in CZs 1, 2, 8, or 11. Foraging habitat value classes for tricolored blackbird are found below in Table 12-4-37. In addition, 20,500 acres of moderate-, high-, or very high-value cultivated lands would be conserved and managed as nonbreeding foraging habitat, 50% of which is high- or very high-value. Finally, at least 4,600 acres of cultivated lands managed as high to very high breeding foraging habitat would be conserved within 5 miles of occupied or recently occupied (within the last 15 years) tricolored blackbird nesting habitat in CZs 1, 2, 3, 4, 7, 8, or 11. These biological goals and objectives would inform the near-term protection and restoration efforts and represent performance standards for considering the effectiveness of restoration actions. The acres of protection and restoration contained in the near-term Plan goals, in addition to the detailed habitat value goals that would be applied to near-term acres, are sufficient to satisfy the typical mitigation ratios that would be applied to the project-level effects of CM1.

Table 12-4-37. Tricolored Blackbird Foraging Habitat Value Classes

Foraging Habitat Value Class	Agricultural Crop Type/Habitats	
	Breeding Season[a] Foraging Habitat	Non-Breeding Season Foraging Habitat
Very high	Native pasture, nonirrigated native pasture, annual grasslands, vernal pool grasslands, alkali grasslands	Livestock feed lots
High	Sunflower, alfalfa and mixed alfalfa, mixed pasture, induced high water table native pasture, nonirrigated mixed pasture, dairies	Corn, sunflower, millet, alfalfa and mixed alfalfa, mixed pasture, native pasture, induced high water table native pasture, nonirrigated native pasture, rice, dairies, annual grasslands, vernal pool grasslands, alkali grasslands
Moderate	Miscellaneous grass pasture, fallow lands cropped within 3 years, new lands prepped for crop production, livestock feed lots	Miscellaneous grass pasture, nonirrigated mixed pasture, fallow lands cropped within 3 years, new lands prepped for crop production
Low	Wheat, mixed grain and hay, farmsteads	Wheat, oats, mixed grain and hay, farmsteads

Marginal	Rice	None
None	All remaining crop types	All remaining crop types
[a] Generally March through August; occasional breeding in fall (September through November).		

The Plan also includes commitments to implement *AMM1 Worker Awareness Training*, *AMM2 Construction Best Management Practices and Monitoring, AMM3 Stormwater Pollution Prevention Plan*, *AMM4 Erosion and Sediment Control Plan*, *AMM5 Spill Prevention, Containment, and Countermeasure Plan*, *AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan*, *AMM7 Barge Operations Plan*, and *AMM21 Tricolored Blackbird*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas and disposal sites. The AMMs are described in detail in BDCP Appendix 3.C.

Late Long-Term Timeframe

Based on the habitat model, the Plan Area supports approximately 147,738 acres of breeding and 236,435 acres of nonbreeding habitat for tricolored blackbird. Although there is a large acreage of modeled breeding habitat available, the Plan Area does not currently support many nesting tricolored blackbirds with the exception of a few occurrences on the fringes of the Plan Area. Alternative 4 as a whole would result in the permanent loss of and temporary effects on 11,671 acres of breeding habitat and to 17,045 acres of nonbreeding habitat for tricolored blackbird during the term of the Plan (8% of the total breeding habitat in the study area and 7% of the total nonbreeding habitat in the study area). The locations of these losses are described above in the analyses of individual conservation measures. The Plan includes a commitment to restore 55,000 acres of tidal natural communities in the study area, providing roosting and nesting habitat for the species. In addition, 10,889 acres of grasslands, alkali seasonal wetland and vernal pool natural communities (2,139 acres of restoration, 8,750 acres of protection) would be protected and restored as a contiguous mosaic of these natural communities and 45,405 acres of cultivated lands protection in the near-term would also provide breeding and nonbreeding foraging habitat for the species (Table 12-4-36). To ensure that natural community conservation benefits tricolored blackbird, the Plan's biological goals and objectives further specify that cultivated lands protected for tricolored blackbird retain residual wetland, grassland patches, shrub stands, and herbaceous edge habitats which may provide suitable nesting, foraging or roosting habitat for the species. Species specific biological goals and objectives for tricolored blackbird with Plan implementation, commit to protecting or restoring at least 50 acres of occupied or recently occupied (within the last 15 years) tricolored blackbird nesting habitat located within 5 miles of high-value foraging habitat in CZs 1, 2, 8, or 11. Foraging habitat value classes for tricolored blackbird are found in Table 12-4-37. In addition, 20,500 acres of moderate-, high-, or very high-value cultivated lands would be conserved and managed as nonbreeding foraging habitat, 50% of which is high- or very high-value. Finally, at least 4,600 acres of cultivated lands managed as high to very high breeding foraging habitat would be conserved within 5 miles of occupied or recently occupied (within the last 15 years) tricolored blackbird nesting habitat in CZs 1, 2, 3, 4, 7, 8, or 11. There are three other factors relevant to effects on tricolored blackbird:

- Very little loss of nesting structure would occur (up to 85 acres).
- Most of the loss of breeding and nonbreeding habitat would be to cultivated lands that are abundant throughout the Plan Area, so the loss is not expected to adversely affect the population in the Plan Area.

- Most temporary impacts would be to cultivated lands and grasslands that could be restored relatively quickly to suitable foraging habitat after completion of construction activities.

The losses of tricolored blackbird aquatic and upland habitat associated with Alternative 4 as a whole would represent an adverse effect as a result of habitat modification of a special-status species and potential for direct mortality in the absence of other conservation actions. However, with habitat protection and restoration associated with CM3, CM4, CM8, and CM11, guided by species-specific goals and objectives and AMM1–AMM7, and *AMM21 Tricolored Blackbird*, which would be in place throughout the time period of construction, the effects of habitat loss or risk of mortality under Alternative 4 on tricolored blackbird would not be adverse.

CEQA Conclusion: Alternative 4 (CM1–CM18) would have both temporary and permanent impacts on tricolored blackbird and its modeled habitat and operation of construction equipment could injure or kill birds.

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the impacts of construction would be less than significant. The Plan would remove 3,344 acres of breeding habitat and 5,630 acres of nonbreeding habitat for tricolored blackbird in the study area in the near-term. These impacts would result from the construction of the water conveyance facilities (CM1, 955 acres of breeding and 2,287 acres of nonbreeding habitat), and implementing other conservation measures (tidal restoration [CM4], Yolo Bypass fisheries improvements [CM2], floodplain restoration [CM5], Nontidal Marsh Restoration [CM10], and Conservation Hatcheries [CM10], 2,389 acres of breeding and 3,343 acres of nonbreeding habitat).

Breeding and nonbreeding habitat for tricolored blackbird include multiple natural communities and typical NEPA and CEQA project-level mitigation ratios would be 1:1 for restoration/creation and 1:1 for protection of these natural communities. Impacts to cultivated lands would be compensated with the protection of cultivated lands at a ratio of 1:1, managed in suitable crop types for the species. Using these typical ratios would indicate that 606 acres of natural communities that benefit tricolored blackbird should be restored and protected (for a total of 1,212 acres), in addition to the protection of 2,636 acres of cultivated lands the near-term to mitigate for the CM1 losses. The offsetting acreage would need to be 624 acres each of restoration and protection of natural communities that benefit tricolored blackbird and the protection of 2,735 acres of suitable cultivated lands if the east-west transmission line alignment was selected for Alternative 4. The near-term effects of other conservation actions would remove 2,389 acres of breeding and 3,343 acres of nonbreeding habitat (4,846 acres of which is cultivated lands), and therefore require 886 acres of restoration and protection of natural communities that benefit tricolored blackbird (for a total of 1,772 acres), in addition to the protection of 4,846 acres of cultivated lands in the near-term time period. using the same typical NEPA and CEQA ratios.

The BDCP has committed to near-term goals of restoring 13,800 acres of tidal wetlands in the study area. In addition, 3,758 acres of grasslands, alkali seasonal wetland and vernal pool natural communities (1,230 acres of restoration, 2,528 acres of protection) would be protected and restored as a contiguous mosaic of these natural communities and 14,600 acres of cultivated lands protection in the near-term would also provide breeding and nonbreeding foraging habitat for the species. The protection and restoration of grassland, alkali seasonal wetland, and vernal pool complex would provide improved foraging opportunities for tricolored blackbirds during both the breeding and nonbreeding season. The conservation lands that lie within a few miles of active nesting colonies would provide high-value foraging areas to support breeding tricolored blackbirds. In addition, through CM3 and CM11, the protected matrix of grassland, vernal pool complex, and alkali seasonal wetland would be managed to increase insect prey through techniques such as grazing practices and avoiding the use of pesticides.

These conservation actions would occur in the same timeframe as the construction and early restoration losses, thereby avoiding adverse effects on tricolored blackbird. To ensure that natural community conservation benefits tricolored blackbird, the Plan's biological goals and objectives further specify that cultivated lands protected for tricolored blackbird retain residual wetland, grassland patches, shrub stands, and herbaceous edge habitats which may provide suitable nesting, foraging or roosting habitat for the species. Species specific biological goals and objectives for tricolored blackbird with Plan implementation, commit to protecting or restoring at least 50 acres of occupied or recently occupied (within the last 15 years) tricolored blackbird nesting habitat located within 5 miles of high-value foraging habitat in CZs 1, 2, 8, or 11. Foraging habitat value classes for tricolored blackbird are found in Table 12-4-37. In addition, 20,500 acres of moderate-, high-, or very high-value cultivated lands would be conserved and managed as nonbreeding foraging habitat, 50% of which is high- or very high-value. Finally, at least 4,600 acres of cultivated lands managed as high- to very high-value breeding foraging habitat would be conserved within 5 miles of occupied or recently occupied (within the last 15 years) tricolored blackbird nesting habitat in CZs 1, 2, 3, 4, 7, 8, or 11. These biological goals and objectives would inform the near-term protection and restoration efforts and represent performance standards for considering the effectiveness of restoration actions. The acres of protection and restoration contained in the near-term Plan goals, in addition to the detailed habitat value goals that would be applied to near-term acres, are sufficient to satisfy the typical mitigation ratios that would be applied to the project-level effects of CM1.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training*, *AMM2 Construction Best Management Practices and Monitoring*, *AMM3 Stormwater Pollution Prevention Plan*, *AMM4 Erosion and Sediment Control Plan*, *AMM5 Spill Prevention, Containment, and Countermeasure Plan*, *AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan*, *AMM7 Barge Operations Plan*, and *AMM21 Tricolored Blackbird*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas and disposal sites. The AMMs are described in detail in BDCP Appendix 3.C.

Late Long-Term Timeframe

The Plan Area supports approximately 147,738 acres of breeding and 236,435 acres of nonbreeding habitat for tricolored blackbird. Although there is a large acreage of modeled breeding habitat available, the Plan Area does not currently support many nesting tricolored blackbirds with the exception of a few occurrences on the fringes of the Plan Area. Alternative 4 as a whole would result in the permanent loss of and temporary effects on 11,671 acres of breeding habitat and to 17,045 acres of nonbreeding habitat for tricolored blackbird during the term of the Plan (8% of the total breeding habitat in the study are and 7% of the total nonbreeding habitat in the study area). The locations of these losses are described above in the analyses of individual conservation measures. The Plan includes a commitment to restore 55,000 acres of tidal natural communities in the study area, providing roosting and nesting habitat for the species. In addition, 10,889 acres of grasslands, alkali seasonal wetland and vernal pool natural communities (2,139 acres of restoration, 8,750 acres of protection) would be protected and restored as a contiguous mosaic of these natural communities and 45,405 acres of cultivated lands protection in the near-term would also provide breeding and nonbreeding foraging habitat for the species (Table 12-4-36). To ensure that natural community conservation benefits tricolored blackbird, the Plan's biological goals and objectives (BDCP, Chapter 3) further specify that cultivated lands protected for tricolored blackbird retain residual wetland, grassland patches, shrub stands, and herbaceous edge habitats which may provide suitable nesting, foraging or roosting habitat for the species. Species specific biological goals and objectives for tricolored blackbird with Plan implementation, commit to protecting or restoring at least 50 acres of occupied or recently occupied (within the last 15 years) tricolored blackbird nesting habitat located within 5 miles of high-value foraging habitat in CZs 1, 2, 8, or 11. Foraging habitat value classes for tricolored blackbird are found in Table 12-4-37. In addition, 20,500 acres of moderate-, high-, or very high-value cultivated lands would be conserved and managed as nonbreeding foraging habitat, 50% of which is high- or very high-value. Finally, at least 4,600 acres of cultivated lands managed as high to very high breeding foraging habitat would be conserved within 5 miles of occupied or recently occupied (within the last 15 years) tricolored blackbird nesting habitat in CZ 1, 2, 3, 4, 7, 8, or 11. There are three other factors relevant to effects on tricolored blackbird.

- Very little loss of nesting structure would occur (up to 85 acres).
- Most of the loss of breeding and nonbreeding habitat would be to cultivated lands that are abundant throughout the Plan Area, so the loss is not expected to adversely affect the population in the Plan Area.
- Most temporary impacts would be to cultivated lands and grasslands that could be restored relatively quickly to suitable foraging habitat after completion of construction activities.

Considering these protection and restoration provisions, which would provide acreages of new or enhanced habitat in amounts greater than necessary to compensate for habitats lost to construction and restoration activities, and implementation of AMM1–AMM7, and AMM21, the loss of habitat or direct mortality though the implementation of Alternative 4 as a whole would not result in a substantial adverse effect through habitat modifications and would not substantially reduce the number or restrict the range of the species. Therefore, the alternative would have a less-than-significant impact on tricolored blackbird.

Impact BIO-88: Effects on tricolored blackbird associated with electrical transmission facilities

New transmission lines would increase the risk that tricolored blackbirds could be subject to power line strikes, which could result in injury or mortality of individuals. Tricolored blackbirds have the potential to intersect the proposed transmission lines largely due to winter movements throughout the Study Area, when individuals are migrating in large flocks and dense fog is common in the area). Although migratory movements may increase the risk of strike hazard, daily flights associated with winter foraging likely occurs in smaller flocks at heights that are lower than the transmission lines (BDCP Attachment 5.J-2, *Memorandum: Analysis of Potential Bird Collisions at Proposed BDCP Transmission Lines*). Transmission line poles and towers provide perching substrate for raptors, which could result in increased predation pressure on local tricolored blackbirds. The existing network of transmission lines in the Plan Area currently poses these risks and any incremental risk associated with the new power line corridors would not be expected to affect the Plan Area population. *AMM20 Greater Sandhill Crane*, would further reduce any potential adverse effects of transmission lines on tricolored blackbird.

CEQA Conclusion: New transmission lines would increase the risk for tricolored blackbird powerline strikes, primarily in winter during migration movements. *AMM20 Greater Sandhill Crane*, would reduce the potential impact of the construction of new transmission lines on tricolored blackbird to a less-than-significant level.

Impact BIO-89: Indirect effects of plan implementation on tricolored blackbird

Indirect construction-related effects: There are up to 239 acres of tricolored blackbird nesting habitat within the vicinity of proposed construction areas that could be indirectly affected by construction activities. Indirect effects associated with construction include noise, dust, and visual disturbance caused by grading, filling, contouring, and other ground-disturbing operations outside the project footprint but within 1,300 feet from the construction edge. Construction and subsequent maintenance-related noise and visual disturbances could mask calls, disrupt foraging and nesting behaviors, and reduce the functions of suitable nesting habitat for these species. *AMM21 Tricolored Blackbird* would require preconstruction surveys, and if detected, covered activities would be avoided within a minimum 250 feet of an active nesting colony and up to 1,300 feet where practicable until breeding has ceased. In addition, monitoring would be implemented to ensure that construction does not adversely affect the nesting colony. The use of mechanical equipment during water conveyance facilities construction could cause the accidental release of petroleum or other contaminants that could affect tricolored blackbird in the surrounding habitat. The inadvertent discharge of sediment or excessive dust adjacent to tricolored blackbird habitat could also affect the species. AMM1–AMM7, including *AMM2 Construction Best Management Practices and Monitoring*, would minimize the likelihood of such spills and ensure that measures are in place to prevent runoff from the construction area and negative effects of dust on active nests.

Methylmercury Exposure: Covered activities have the potential to exacerbate bioaccumulation of mercury in avian species, including tricolored blackbird. Marsh (tidal and nontidal) and floodplain restoration also have the potential to increase exposure to methylmercury. Mercury is transformed into the more bioavailable form of methylmercury in aquatic systems, especially areas subjected to regular wetting and drying such as tidal marshes and flood plains (Alpers et al. 2008). Thus, BDCP restoration activities that create newly inundated areas could increase bioavailability of mercury (see BDCP Chapter 3 *Conservation Strategy*, for details of restoration).

The potential mobilization or creation of methylmercury within the Plan Area varies with site-specific conditions and would need to be assessed at the project level. *CM12 Methylmercury Management* contains provisions for project-specific Mercury Management Plans. Breeding tricolored blackbirds are not thought to be highly susceptible to methylmercury exposure because tidal wetlands are not expected to be a major foraging area for the species. Furthermore, the Suisun Marsh Plan (Bureau of Reclamation et al. 2010) anticipates that tidal wetlands restored under the plan would generate less methylmercury than the existing managed wetlands, potentially reducing the overall risk. However, species sensitivity to methylmercury differs widely and there is a large amount of uncertainty with respect to species-specific effects and increased methylmercury associated with natural community and floodplain restoration could indirectly affect tricolored blackbird, via uptake in lower tropic levels (as described in the BDCP, Appendix 5.D, *Contaminants*). Site-specific restoration plans that address the creation and mobilization of mercury, as well as monitoring and adaptive management as described in CM12 would be available to address the uncertainty of methylmercury levels in restored tidal marsh and potential impacts on tricolored blackbird.

CEQA Conclusion: Impacts of noise, the potential for hazardous spills, increased dust and sedimentation, and operations and maintenance of the water conveyance facilities would be less than significant with the implementation of *AMM21 Tricolored Blackbird* and AMM1–AMM7. The implementation of tidal natural communities restoration or floodplain restoration could result in increased exposure of tricolored blackbird to methylmercury. It is unlikely that breeding tricolored blackbird would be highly susceptible to methylmercury exposure because tidal wetlands are not expected to be a major foraging area for the species. However, it is unknown what concentrations of methylmercury are harmful to this species. Site-specific restoration plans that address the creation and mobilization of mercury, as well as monitoring and adaptive management as described in *CM12 Methylmercury Management*, would better inform the potential effects of methylmercury on tricolored blackbird.

Impact BIO-90: Periodic effects of inundation of tricolored blackbird habitat as a result of implementation of conservation components

Flooding of the Yolo Bypass (CM2) would inundate 2,665–4,767 acres of breeding habitat and 267–1,180 acres of nonbreeding habitat (Table 12-4-36). Based on hypothetical floodplain restoration, construction of setback levees for *CM5 Seasonally Inundated Floodplain Restoration* could result in periodic inundation of approximately 1,993 acres of breeding habitat and 2,574 acres of nonbreeding habitat (Table 12-4-36) resulting in the temporary loss of these habitats. Tricolored blackbirds are highly nomadic during the winter and would be expected to move to adjacent suitable foraging habitat when the bypass is inundated, as they do under the current flooding regime. However, this inundation could reduce the availability of nesting habitat during years when flooding extends into the nesting season (past March).

The periodic inundation of the Yolo Bypass (CM2) and of other floodplains (CM5) is expected to restore a more natural flood regime in support of wetland and riparian vegetation types that support nesting habitat. There would be no expected adverse effect on tricolored blackbird.

CEQA Conclusion: Implementation of CM2 and CM5 would result in periodic inundation of nesting and foraging habitat for tricolored blackbird. Periodic inundation would have a less-than-significant impact on tricolored blackbird because inundation is expected to take place outside of the breeding season, and although foraging habitat would be temporarily unavailable, tricolored blackbirds are highly nomadic in winter and wintering birds would be expected to move to adjacent foraging habitat.

Western Burrowing Owl

Western burrowing owl modeled habitat consisted of high- and low-value habitat for nesting and foraging. High-value habitat consists of plant alliances within the grassland and vernal pool natural communities and pasture. Low-value habitat includes plant alliances and crop types from managed wetland, alkali seasonal wetland, and cultivated lands. Value was determined through reported species use patterns from the literature.

Construction and restoration associated with Alternative 4 conservation measures would result in both temporary and permanent losses of western burrowing owl modeled habitat as indicated in Table 12-4-38. Full implementation of Alternative 4 would restore or create 2,000 acres, and protect 8,000 acres of grassland habitat for the species (Table 12-4-38). In addition, 67 acres of vernal pool complex would be restored or created and 600 acres would be protected under the BDCP. Protection of alkali seasonal wetland and cultivated lands would also provide habitat for the species. As explained below, with the restoration or protection of these amounts of habitat, impacts on western burrowing owl would not be adverse for NEPA purposes and would be less than significant for CEQA purposes.

Table 12-4-38. Changes in Western Burrowing Owl Modeled Habitat Associated with Alternative 4 (acres)[a]

	Conservation Measure[b]	Habitat Type	Permanent		Temporary		Periodic[d]	
			NT	LLT	NT	LLT	Yolo	Floodplain
Habitat Affected[c]	CM1	High-value	326	326	266	266	NA	NA
		Low-value	2,171	2,171	654	654	NA	NA
	Total Impacts CM1		**2,497**	**2,497**	**920**	**920**		
	CM2–CM18	High-value	4,135	9,512	173	239	1,195–3,004	672
		Low-value	3,092	25,279	242	1,088	1,595–2,827	6,250
	Total Impacts CM2–CM18		**7,227**	**34,791**	**415**	**1,327**	**2,790–5,831**	**6,922**
	TOTAL IMPACTS		**9,724**	**37,288**	**1,335**	**2,247**	**2,790-–5,831**	**6,922**
	CM3 alkali seasonal wetland		58	72	NA	NA	NA	NA
	CM8 grassland		1,140	2,000	NA	NA	NA	NA
	CM9 vernal pool		40	67	NA	NA	NA	NA
	Total Restoration/Creation		**1,238**	**2,139**				
Habitat Protected[e]	CM3 grassland		2,000	8,000	NA	NA	NA	NA
	CM3 alkali seasonal wetland		120	150	NA	NA	NA	NA
	CM3 vernal pool complex		400	600	NA	NA	NA	NA
	CM3 cultivated lands (nonrice)		14,600	45,405	NA	NA	NA	NA
	Total Protection		**17,120**	**54,155**				

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late long-term timeframes.

[b] See discussion below for a description of applicable CMs.

[c] LLT acreages are a summation of effects that would occur in the near-term, early long-term and late long-term timeframes. The LLT acreages represent the total amount of habitat that would be affected over the 50-year life of the BDCP and do not reflect habitat increases that would result from restoration, creation and protection activities.

[d] Periodic effects were estimated for the late long-term only. Yolo periodic impacts are presented as a range based on different flow regimes at the proposed notch in Fremont Weir.

[e] Restored/created and protected habitat acreages represent planned conservation activities that would be implemented over the lifetime of the BDCP (see BDCP Chapter 3, *Conservation Strategy*, for specifics).

NT = near-term

LLT = late long-term

NA = not applicable

Impact BIO-91: Loss or conversion of habitat for and direct mortality of western burrowing owl

Alternative 4 conservation measures would result in the combined permanent and temporary loss of up to 39,535 acres of modeled habitat for western burrowing owl (of which 10,343 acres is of high-value and 29,192 acres is of low value, Table 12-4-38). Conservation measures that would result in these losses are conveyance facilities and transmission line construction, and establishment and use of borrow and spoil areas (CM1), *CM2 Yolo Bypass Fisheries Enhancement*, *CM4 Tidal Natural Communities Restoration*, *CM5 Seasonally Inundated Floodplain Restoration*, *CM6 Channel Margin Enhancement*, *CM8 Grassland Natural Community Restoration*, *CM10 Nontidal Marsh Restoration*, and *CM18 Conservation Hatcheries*. The majority of habitat loss would result from CM4. Habitat enhancement and management activities (CM11), which include ground disturbance or removal of nonnative vegetation, could result in local adverse habitat effects. In addition, maintenance activities associated with the long-term operation of the water conveyance facilities and other BDCP physical facilities could degrade or eliminate western burrowing owl habitat. Each of these individual activities is described below. A summary statement of the combined impacts and NEPA and CEQA conclusions follows the individual conservation measure discussions.

- *CM1 Water Facilities and Operation*: Construction of Alternative 4 conveyance facilities would result in the combined permanent and temporary loss of up to 3,417 acres of modeled western burrowing owl habitat (592 acres of high-value, 2,825 acres of low-value) from CZs 3–6 and CZ 8. The majority of high-value grassland that would be removed would be in CZ 8, from the construction of the Byron Forebay. There are several CNDDB and DHCCP survey records for western burrowing owls in that area and the loss of high-value habitat from facility construction and the establishment of the forebay borrow and spoils area could remove occupied habitat, displace nesting and wintering owls, and fragment occupied burrowing owl habitat. Refer to the Terrestrial Biology Map Book for a detailed view of Alternative 4 construction locations.

  There would be a 64 acre decrease in the combined permanent and temporary loss of western burrowing owl habitat associated with the construction of the east-west transmission line for the Alternative 4 water conveyance facility rather than the north-south transmission line. This difference in impacts would result from a 27 acre increase in loss of high-value habitat, and a 91 acre decrease in loss of low-value habitat with the selection of the east-west transmission line compared to the north-south alignment.

- *CM2 Yolo Bypass Fisheries Enhancement*: Construction of the Yolo bypass fisheries enhancement would permanently remove 847 acres (739 acres of high-value and 108 acres of low-value) of modeled burrowing owl habitat in the Yolo Bypass in CZ 2. In addition, 415 acres (173 acres of high-value and 242 acres of low-value) would be temporarily removed.

- *CM4 Tidal Natural Communities Restoration*: Tidal habitat restoration site preparation and inundation would permanently remove an estimated 25,549 acres of modeled western burrowing owl habitat in CZs 1, 2, 4, 5, 6, 7, 8, 10, and 11. The majority of removed or converted acres is composed of low-value habitat. However, 8,097 acres of high-value habitat would also be lost from tidal restoration actions. Tidal restoration would directly impact and fragment remaining high-value grassland habitat just north of Rio Vista in and around French and Prospect Islands, and in an area south of Rio Vista around Threemile Slough. Tidal natural community restoration efforts would impact one extant record of burrowing owl just northeast of Oakley along Dutch Slough and one possibly extirpated record in Suisun Marsh.

- *CM5 Seasonally Inundated Floodplain Restoration*: Construction of setback levees to restore seasonally inundated floodplain (CM5) would permanently and temporarily remove approximately 6,485 acres of modeled western burrowing owl in CZs 2, 4, and 7. This total is comprised of 6,299 acres of low-value habitat. Also, 186 acres of high-value grassland habitat would be removed (120 permanent, 66 temporary) consisting of small patches of habitat along the San Joaquin, Old, and Middle Rivers in Conservation Zone 7.
- *CM6 Channel Margin Enhancement*: Sites for channel margin enhancement would be located along levees where western burrowing owl could be present. The species is known to use often the grassland edges along canals and levees in agricultural areas, including in the Central Valley (see BDCP Appendix 2.A, *Covered Species Accounts*).
- *CM8 Grassland Natural Community Restoration*: Grassland restoration would primarily be implemented on agricultural lands and would result in the permanent loss of 1,676 acres (362 acres of high-value and 1,314 acres of low-value) of western burrowing owl habitat. The conversion of 1,676 acres of low-value habitat to high-value grassland, would ultimately have a beneficial effect on the western burrowing owl.
- *CM10 Nontidal Marsh Restoration*: Implementation would result in the permanent removal of 159 acres of high-value and 952 acres of low-value western burrowing owl habitat.
- *CM11 Natural Communities Enhancement and Management*: A variety of habitat management actions that are designed to enhance wildlife values in restored or protected habitats could result in localized ground disturbances that could temporarily remove small amounts of western burrowing owl habitat. The burrowing owl's fossorial habits make the species more sensitive to the effects of ground disturbance than other raptors. Ground-disturbing activities, such as removal of nonnative vegetation and road and other infrastructure maintenance activities, would be expected to have minor adverse effects on available western burrowing owl habitat and would be expected to result in overall improvements to and maintenance of habitat values over the term of the BDCP. Equipment operation could destroy nests burrows, and noise and visual disturbances could lead to their abandonment, resulting in mortality of eggs and nestlings. The potential for these activities to result in nest failure and mortality or other adverse effects on western burrowing owl would be avoided or minimized with the incorporation of *AMM24 Western Burrowing Owl* into the BDCP which would require surveys to determine presence or absence and the establishment of no-disturbance buffers around active sites. With full implementation of the BDCP, enhancement and management actions would be expected to benefit the species. Western burrowing owl would benefit particularly from protection of high-value habitat against potential loss or degradation that otherwise could occur with future changes in existing land use. Habitat enhancement actions to increase small mammal abundance in protected habitats would also benefit the western burrowing owl.
- *CM18 Conservation Hatcheries*: Implementation of CM18 would remove up to 35 acres of high-value western burrowing owl habitat.
- Operations and Maintenance: Postconstruction operation and maintenance of the above-ground water conveyance facilities and restoration infrastructure could result in ongoing but periodic disturbances that could affect western burrowing owl use of the surrounding habitat. Maintenance activities would include vegetation management, levee and structure repair, and re-grading of roads and permanent work areas. These effects, however, would be reduced by AMMs and conservation actions as described below.

- Injury and Direct Mortality: Construction would not be expected to result in direct mortality of western burrowing owl. However, if nest burrows were occupied in the vicinity of construction activities, equipment operation could destroy nests and noise and visual disturbances could lead to abandonment. *AMM24 Western Burrowing Owl* would ensure that preconstruction surveys detected any occupied burrows and no disturbance buffers would be implemented.

The following paragraphs summarize the combined effects discussed above and describe other BDCP conservation actions that offset or avoid these effects. NEPA and CEQA impact conclusions are also included.

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the effects of construction would not be adverse under NEPA and would be less than significant under CEQA. The Plan would remove 11,059 acres of modeled (4,900 acres of high-value and 6,159 of low-value) habitat for western burrowing owl in the study area in the near-term. These effects would result from the construction of the water conveyance facilities (CM1, 592 acres of high-value habitat, 2,825 acres of low-value habitat), and implementing other conservation measures (Yolo Bypass Fisheries Enhancement [CM2] Tidal Natural Communities Restoration [CM4], Seasonally Inundated Floodplain Restoration [CM5], Grassland Natural Community Restoration [CM8], Nontidal Marsh Restoration [CM10], and Conservation Hatcheries [CM18] 4,308 acres of high-value habitat, 3,334 acres of low-value habitat).

Typical NEPA and CEQA project-level mitigation ratios for those natural communities affected by CM1 and that are identified in the biological goals and objectives for western burrowing owl in Chapter 3 of the BDCP would be 2:1 protection for loss of high-value and 1:1 protection for loss of low-value western burrowing owl habitat. Using these typical ratios would indicate that 1,184 acres should be protected to compensate for loss of high-value habitat and 2,825 acres should be protected to compensate for loss of low-value habitat from CM1. The offsetting acreage would need to be 1,238 acres of protection for loss of high-value habitat and 2,734 acres for loss of low-value habitat if the east-west transmission line alignment was selected for Alternative 4. The near-term effects of other conservation actions would require the protection of 8,616 acres for high-value habitat loss and 3,332 acres for low-value habitat loss using the same typical NEPA and CEQA ratios (2:1 protection for loss of high-value habitat and 1:1 protection for loss of low-value habitat).

The BDCP has committed to near-term goals of protecting 2,000 acres and restoring 1,140 acres of high-value grassland natural community in CZs 1, 2, 4, 5, 7, 8, and 11; protecting 400 acres and restoring 40 acres of vernal pool complex in CZs 1, 8, and 11; protecting 120 acres and restoring 58 acres of alkali seasonal wetland in CZs 1, 8, and/or 11; and protecting 14,600 acres of cultivated lands (excluding rice-lands). The protection of high-value grasslands is essential in order to sustain existing western burrowing owl populations in the plan area. The protection and restoration of grasslands, alkali seasonal wetland and vernal pool natural communities would be protected as a contiguous mosaic of these natural communities which would provide habitat for western burrowing owl and reduce the effects of current levels of habitat fragmentation. This protection would not only expand the amount of protected high-value habitat in the Plan Area, but also support existing western burrowing owl populations that occur to the west of CZ 8 and in the areas surrounding CZs 1 and 11, which would especially benefit declining populations in the vicinity of

Suisun Marsh and San Pablo Bay. Certain types of cultivated lands such as irrigated pasture, alfalfa and other hay crops, and some row crops can provide foraging habitat for western burrowing owl. Under appropriate management regimes, cultivated lands can support breeding and wintering burrowing owls. To ensure that cultivated lands conservation benefits western burrowing owl, the Plan's biological goals and objectives further specify that, of the cultivated lands protected in the late long-term, at least 1,000 acres would be protected in CZs 1 and 11 that support high-value burrowing owl habitat and are within 0.5 miles of high-value grassland habitat or occupied low-value habitat. Under *CM11 Natural Communities Enhancement and Management*, small mammal and insect prey populations would be increased on protected lands, enhancing the foraging value of these natural communities. In addition, burrow availability would be increased on protected natural communities by encouraging ground squirrel occupancy and expansion through the creation of berms, mounds, edges, and through the prohibition of ground squirrel control programs (i.e., poisoning).

The combined acres of protection and restoration of 3,758 acres of high-value habitat would satisfy the typical mitigation ratios that would be applied to the project-level effects of CM1. Some portion of the 14,600 acres of cultivated lands would also contain high-value irrigated pasture. These acres in addition to the management and enhancement activities contained in the Plan goals, would satisfy the typical mitigation ratios that would be applied to the other near-term conservation actions, providing that the 14,600 acres of cultivated lands protected in the near-term, were managed in suitable crop types to compensate for the loss of high-value habitat at a ratio of 2:1. Mitigation Measure BIO-91, *Compensate for loss of high-value burrowing owl habitat at*, would be available to address the potential adverse effect of high-value habitat loss from near-term conservation actions.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training*, *AMM2 Construction Best Management Practices and Monitoring*, *AMM3 Stormwater Pollution Prevention Plan*, *AMM4 Erosion and Sediment Control Plan*, *AMM5 Spill Prevention, Containment, and Countermeasure Plan*, *AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan*, *AMM7 Barge Operations Plan*, and *AMM24 Western Burrowing Owl*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas and disposal sites. The AMMs are described in detail in BDCP Appendix 3.C.

Late Long-Term Timeframe

Based on the habitat model, the study area supports approximately 128,781 acres of high-value and 234,903 acres of low-value habitat for western burrowing owl. Alternative 4 as a whole would result in the permanent loss of and temporary effects on 10,343 acres of high-value habitat and to 29,192 acres of low-value habitat for western burrowing owl during the term of the Plan (8% of the total primary habitat in the study area and 12% of the total low-value habitat in the study area). The locations of these losses are described above in the analyses of individual conservation measures. The Plan includes a commitment to restore or create at least 2,139 acres of western burrowing owl habitat in CZs 1, 8, and 11 and to protect 54,155 acres of habitat in the study area. 8,750 acres would consist of a mosaic of high-value grasslands, alkali seasonal wetlands, and vernal pool complex. Of the 45,405 acres of cultivated lands protected, a minimum of 1,000 acres would be protected in CZs 1 and 11 that support high-value burrowing owl habitat and are within 0.5 miles of high-value grassland habitat or occupied low-value habitat. All protected habitat would be managed under CM11 Natural communities enhancement and management to increase small mammal and insect prey populations on protected lands, enhancing the foraging value of these natural communities. In addition, burrow availability would be increased on protected natural communities by encouraging ground squirrel occupancy and expansion through the creation of berms, mounds, edges, and through the prohibition of ground squirrel control programs (i.e., poisoning).

The loss of western burrowing owl habitat associated with Alternative 4 would represent an adverse effect as a result of habitat modification of a special-status species and potential for direct mortality in the absence of other conservation actions. However, with habitat protection and restoration associated with CM3, CM8, and CM11, guided by biological goals and objectives and AMM1–AMM7, and AMM24, which would be in place throughout the construction time period, the effects of habitat loss and potential mortality under Alternative 4 on western burrowing owl would not be adverse.

CEQA Conclusion: Alternative 4 (CM1–CM5, and CM11) would have both temporary and permanent impacts on western burrowing owl and their modeled habitat and operation of construction equipment could kill, injure, or disturb individuals, if present in the study area.

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the impacts of construction would be less than significant. The Plan would remove 11,059 acres of modeled (4,900 acres of high-value and 6,159 of low-value) habitat for western burrowing owl in the study area in the near-term. These impacts would result from the construction of the water conveyance facilities (CM1, 592 acres of high-value habitat, 2,825 acres of low-value habitat), and implementing other conservation measures (*CM2 Yolo Bypass Fisheries Enhancement*, *CM4 Tidal Natural Communities Restoration*, *CM5 Seasonally Inundated Floodplain Restoration*, *CM8 Grassland Natural Community Restoration*, *CM10 Nontidal Marsh Restoration*, and *CM18 Conservation Hatcheries*—4,308 acres of high-value habitat, 3,334 acres of low-value habitat).

Typical NEPA and CEQA project-level mitigation ratios for those natural communities impacted by CM1 and that are identified in the biological goals and objectives for western burrowing owl in Chapter 3 of the BDCP would be 0:1 for restoration/creation and 2:1 protection of western burrowing owl habitat. Using these typical ratios would indicate that 6,834 acres of habitat should be protected to mitigate for the CM1 losses of 3,417 acres of western burrowing owl habitat. The offsetting acreage would need to be 6,706 acres of protection (because of the impact on 3,353 acres) if the east-west transmission line alignment was selected for Alternative 4. The near-term effects of other conservation actions would remove 7,642 acres of modeled habitat, and, therefore, require 15,284 acres of protection of western burrowing owl habitat using the same typical NEPA and CEQA ratios (0:1 for restoration and 2:1 for protection).

The BDCP has committed to near-term goals of protecting 2,000 acres and restoring 1,140 acres of high-value grassland natural community in CZs 1, 2, 4, 5, 7, 8, and 11; protecting 400 acres and restoring 40 acres of vernal pool complex in CZs 1, 8, and 11; protecting 120 acres and restoring 58 acres of alkali seasonal wetland in CZ 1, 8, and/or 11; and protecting 14,600 acres of cultivated lands (excluding rice-lands). The protection of high-value grasslands is essential in order to sustain existing western burrowing owl populations in the plan area. The protection and restoration of grasslands, alkali seasonal wetland and vernal pool natural communities would be protected as a contiguous mosaic of these natural communities which would provide habitat for western burrowing owl and reduce the effects of current levels of habitat fragmentation. This protection would not only expand the amount of protected high-value habitat in the Plan Area, but also support existing western burrowing owl populations that occur to the west of CZ 8 and in the areas surrounding CZs 1 and 11, which would especially benefit declining populations in the vicinity of Suisun Marsh and San Pablo Bay. Certain types of cultivated lands such as irrigated pasture, alfalfa and other hay crops, and some row crops can provide foraging habitat for western burrowing owl. Under appropriate management regimes, cultivated lands can support breeding and wintering burrowing owls. To ensure that cultivated lands conservation benefits western burrowing owl, the Plan's biological goals and objectives further specify that, of the cultivated lands protected in the late long-term, at least 1,000 acres would be protected in CZ 1 and 11 that support high-value burrowing owl habitat and are within 0.5 miles of high-value grassland habitat or occupied low-value habitat. Under *CM11 Natural Communities Enhancement and Management*, small mammal and insect prey populations would be increased on protected lands, enhancing the foraging value of these natural communities. In addition, burrow availability would be increased on protected natural communities by encouraging ground squirrel occupancy and expansion through the creation of berms, mounds, edges, and through the prohibition of ground squirrel control programs (i.e., poisoning).

The combined acres of protection and restoration of 3,758 acres of high-value habitat would satisfy the typical mitigation ratios that would be applied to the project-level effects of CM1. Some portion of the 14,600 acres of cultivated lands would also contain high-value irrigated pasture. These acres in addition to the management and enhancement activities contained in the Plan goals, would satisfy the typical mitigation ratios that would be applied to the other near-term conservation actions, providing that the 14,600 acres of cultivated lands protected in the near-term, were managed in suitable crop types to compensate for the loss of high-value habitat at a ratio of 2:1. Mitigation Measure BIO-91, *Compensate for loss of high-value burrowing owl habitat*, would be available to reduce the potential adverse effect of high-value habitat loss from near-term conservation actions to a less-than-significant impact.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training*, *AMM2 Construction Best Management Practices and Monitoring, AMM3 Stormwater Pollution Prevention Plan*, *AMM4 Erosion and Sediment Control Plan*, *AMM5 Spill Prevention, Containment, and Countermeasure Plan*, *AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan*, *AMM7 Barge Operations Plan*, and *AMM24 Western Burrowing Owl*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas and disposal sites. The AMMs are described in detail in BDCP Appendix 3.C.

Late Long-Term Timeframe

The study area supports approximately 128,781 acres of high-value and 234,903 acres of low-value habitat for western burrowing owl. Alternative 4 as a whole would result in the permanent loss of and temporary effects on 10,343 acres of high-value habitat and to 29,192 acres of low-value habitat for western burrowing owl during the term of the Plan (8% of the total primary habitat in the study area and 12% of the total low-value habitat in the study area). The locations of these losses are described above in the analyses of individual conservation measures. The Plan includes a commitment to restore or create at least 2,139 acres of western burrowing owl habitat in CZs 1, 8, and 11 and to protect 54,155 acres of habitat in the study area. 8,750 acres would consist of a mosaic of high-value grasslands, alkali seasonal wetlands, and vernal pool complex. Of the 45,405 acres of cultivated lands protected, a minimum of 1,000 acres would be protected in CZs 1 and 11 that support high-value burrowing owl habitat and are within 0.5 miles of high-value grassland habitat or occupied low-value habitat. All protected habitat would be managed under CM11 Natural communities enhancement and management to increase small mammal and insect prey populations on protected lands, enhancing the foraging value of these natural communities. In addition, burrow availability would be increased on protected natural communities by encouraging ground squirrel occupancy and expansion through the creation of berms, mounds, edges, and through the prohibition of ground squirrel control programs (i.e., poisoning).

Considering these protection and restoration provisions, which would provide acreages of new high-value or enhanced habitat in amounts suitable to compensate for habitats lost to construction and restoration activities, and implementation of AMM1–AMM7, and AMM24, the loss of habitat or direct mortality through implementation of Alternative 4 would not result in a substantial adverse effect through habitat modifications and would not substantially reduce the number or restrict the range of the species. Therefore, the loss of habitat or potential mortality under this alternative would have a less-than-significant impact on western burrowing owl.

Mitigation Measure BIO-91: Compensate for loss of high-value burrowing owl habitat

Due to the uncertainty of the crop types that would be protected within the 14,600 acres of cultivated lands protected in the near-term time period, loss of high-value burrowing owl habitat would need to be compensated with other high-value natural community plants or cultivated crop types for in the near-term at a ratio of 2:1.

Impact BIO-92: Effects on western burrowing owl associated with electrical transmission facilities

New transmission lines would increase the risk for bird-power line strikes and/or electrocution, which could result in injury or mortality of western burrowing owl. The species is large-bodied but with relatively long and rounded wings, making it moderately maneuverable. While burrowing owls may nest in loose colonies, they do not flock or congregate in roosts or foraging groups. Collectively, the species' keen eyesight and largely ground-based hunting behavior make it a relatively low-risk species for powerline collision. While the species in not widespread in the Plan Area, it may become more widely distributed as grassland enhancement improves habitat for the species. Even so, the risk of effects on the population are low, given its physical and behavioral characteristics (BDCP Attachment 5.J-2, *Memorandum: Analysis of Potential Bird Collisions at Proposed BDCP Transmission Lines*) and new transmission lines would not be expected to have an adverse effect on the species.

CEQA Conclusion: The construction and presence of new transmission lines would have a less-than-significant impact on western burrowing owl because the risk of bird strike is considered to be minimal based on the owl's physical and behavioral characteristics.

Impact BIO-93: Indirect effects of plan implementation on western burrowing owl

Noise and visual disturbances associated with construction-related activities could result in temporary disturbances that affect western burrowing owl use of an estimated 15,144 acres of modeled habitat (5,005 acres of which is high-value habitat) adjacent to proposed construction areas. Indirect effects associated with construction include noise, dust, and visual disturbance caused by grading, filling, contouring, and other ground-disturbing operations. Any disturbance within 250 feet of a burrow occupied by burrowing owl during the breeding season (February 1–August 31) and within 160 feet during the nonbreeding season (September 1–January 31) could potential displace winter owls or cause abandonment of active nests. These potential adverse effects would be minimized with incorporation of *AMM24 Western Burrowing Owl* into the BDCP, which would require preconstruction surveys and establish no-disturbance buffers around active burrows.

The use of mechanical equipment during water conveyance facilities construction could cause the accidental release of petroleum or other contaminants that could affect western burrowing owl in the surrounding habitat. The inadvertent discharge of sediment or excessive dust adjacent to western burrowing owl habitat could also affect the species. AMM1–AMM7, including AMM2 (Construction BMPs and Monitoring), in addition to *AMM24 Western Burrowing Owl* would minimize the likelihood of such spills from occurring and ensure that measures were in place to prevent runoff from the construction area and any adverse effects of dust on active nests.

CEQA Conclusion: The potential for noise and visual disturbance, hazardous spills, increased dust and sedimentation, and the potential impacts of operations and maintenance of the water conveyance facilities would have a less-than-significant impact on western burrowing owl with the incorporation of AMM1–AMM7, and *AMM24 Western Burrowing Owl* into the BDCP.

Impact BIO-94: Periodic effects of inundation on western burrowing owl habitat as a result of implementation of conservation components

Flooding of the Yolo Bypass from Fremont Weir operations (*CM2 Yolo Bypass Fisheries Enhancement*) would increase the frequency and duration of inundation on approximately 1,195–3,004 acres of high-value habitat and 1,595–2,827 acres of low-value habitat (Table 12-4-38).

Based on hypothetical footprints, implementation of *CM5 Seasonally Inundated Floodplain Restoration*, could result in the periodic inundation of up to approximately 6,922 acres of modeled habitat (6,250 acres, of which would be low-value foraging habitat; Table 12-4-38).

Burrowing owls cannot use inundated areas for foraging or nesting, and increased inundation frequency and duration of cultivated lands and grassland habitats may affect prey populations that have insufficient time to recover following inundation events. Depending on timing, seasonal inundation of western burrowing owl habitat could result in displacement from nesting burrows or drowning of individuals. The potential for this effect is considered low because suitable burrow sites would most likely be located along setback levees, which are expected to be subject to inundation less frequently than floodplain surfaces that would be less likely to support suitable nesting burrows. The periodically inundated habitat would not be expected to have an adverse effect on the population.

CEQA Conclusion: Implementation of CM2 would increase the frequency and duration of inundation on approximately 1,195–3,004 acres of high-value habitat and 1,595–2,827 acres of low-value habitat. In addition, implementation of CM5 could result in the periodic inundation of up to 6,922 acres of modeled habitat (6,250 acres of which would be low-value foraging habitat). Periodic inundation would be expected to have a less-than-significant impact on the population. The potential for direct mortality of western burrowing owl caused by inundation would be low because the locations of burrows would likely be above elevations consistently subject to inundation; therefore, the potential impact would be less than significant.

Western Yellow-Billed Cuckoo

The habitat model for Western yellow-billed cuckoo includes potential breeding habitat, which includes plant alliances from the valley/foothill riparian modeled habitat that contain a dense forest canopy for foraging with understory willow for nesting, and a minimum patch size of 25 acres, and migratory habitat, which includes the same plant alliances as breeding habitat without the minimum 25 acres patch size requirement.

Construction and restoration associated with Alternative 4 conservation measures would result in both temporary and permanent losses of Western yellow-billed cuckoo modeled habitat as indicated in Table 12-4-39. The western yellow-billed cuckoo is uncommon in the Plan Area at present, and the likelihood that it would be found using the modeled habitat is low relative to more abundant riparian species. Nesting of the species in the plan area has not been confirmed for approximately 100 years. Western yellow-billed cuckoo was detected in the Plan Area during 2009 BDCP surveys, but nesting was not confirmed and the bird is suspected to be a migrant (Appendix 12C, *2009 to 2011 Bay Delta Conservation Plan EIR/EIS Environmental Data Report*). Full implementation Alternative 4 actions that are expected to affect western yellow-billed cuckoo, would restore or create 5,000 acres and protect 750 acres of riparian habitat, at least 500 acres of which would be mature riparian forest intermixed with a portion of early- to mid-successional riparian vegetation in large blocks with a minimum patch size of 50 acres and a minimum width of 100 meters. As explained below, with the restoration or protection of these amounts of habitat, impacts to western yellow-billed cuckoo would not be adverse for NEPA purposes and would be less than significant for CEQA purposes.

Table 12-4-39. Changes in Western Yellow-Billed Cuckoo Modeled Habitat Associated with Alternative 4 (acres)[a]

	Conservation Measure[b]	Habitat Type	Permanent		Temporary		Periodic[d]	
			NT	LLT	NT	LLT	Yolo	Floodplain
Habitat Affected[c]	CM1	Breeding	0	0	0	0	NA	NA
		Migratory	20	20	14	14	NA	NA
	Total Impacts CM1		**20**	**20**	**14**	**14**		
	CM2–CM18	Breeding	256	386	120	139	23–37	28
		Migratory	183	261	16	23	21–45	114
	Total Impacts CM2–CM18		**439**	**647**	**136**	**162**	**44–82**	**142**
	TOTAL IMPACTS		**459**	**667**	**150**	**176**	**44–82**	**142**
Habitat Restored/ Created[e]	CM7 riparian restoration		800	5,000	NA	NA	NA	NA
	Total Restoration/Creation		**800**	**5,000**				
Habitat Protected[e]	CM3 riparian protection		750	NA	NA	NA	NA	NA
	Total Protection		**750**					

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late long-term timeframes.

[b] See discussion below for a description of applicable CMs.

[c] LLT acreages are a summation of effects that would occur in the near-term, early long-term and late long-term timeframes. The LLT acreages represent the total amount of habitat that would be affected over the 50-year life of the BDCP and do not reflect habitat increases that would result from restoration, creation and protection activities.

[d] Periodic effects were estimated for the late long-term only. Yolo periodic impacts are presented as a range based on different flow regimes at the proposed notch in Fremont Weir.

[e] Restored/created and protected habitat acreages represent planned conservation activities that would be implemented over the lifetime of the BDCP (see BDCP Chapter 3, *Conservation Strategy*, for specifics).

NT = near-term

LLT = late long-term

NA = not applicable

Impact BIO-95: Loss or conversion of habitat for and direct mortality of western yellow-billed cuckoo

Alternative 4 conservation measures would result in the combined permanent and temporary loss of up to 843 acres of modeled habitat for western yellow-billed cuckoo (Table 12-4-39). Conservation measures that would result in these losses are conveyance facilities and transmission line construction, and establishment and use of borrow and spoil areas (CM1), Fremont Weir/Yolo Bypass improvements (CM2), tidal habitat restoration (CM4), and floodplain restoration (CM5). Habitat enhancement and management activities (CM11) which include ground disturbance or removal of nonnative vegetation, could result in local adverse habitat effects. In addition, maintenance activities associated with the long-term operation of the water conveyance facilities and other BDCP physical facilities could degrade or eliminate western yellow-billed cuckoo modeled habitat. Each of these individual activities is described below. A summary statement of the combined impacts and NEPA and CEQA conclusions follows the individual conservation measure discussions.

- *CM1 Water Facilities and Operation*: Construction of Alternative 4 water conveyance facilities would result in the combined permanent and temporary loss of up to 34 acres of modeled western yellow-billed cuckoo migratory habitat (Table 12-4-39). No modeled breeding habitat would be impacted by CM1. Of the 34 acres of modeled habitat that would be removed for the construction of the conveyance facilities, 20 acres would be a permanent loss and 14 acres would be a temporary loss of migratory habitat. This loss would have the potential to displace individuals, if present, and remove the functions and value of potentially suitable habitat for resting, protection, or foraging. Activities that would impact modeled habitat consist of tunnel, forebay, and intake construction, temporary access roads, and construction of transmission lines. Impacts from CM1 would occur in the central delta in CZ 3, CZ 4, CZ 5, CZ 6, and CZ 8. Refer to the Terrestrial Biology Map Book for a detailed view of Alternative 4 construction locations.

  There would be a 6 acre increase in the combined permanent and temporary loss of western yellow-billed cuckoo breeding habitat, and a 3 acre decrease in the loss of migratory habitat (resulting in a net 3 acre increase of modeled habitat) associated with the construction of the east-west transmission line for the Alternative 4 water conveyance facilities rather than the north-south transmission line.

- *CM2 Yolo Bypass Fisheries Enhancement*: Construction of the Yolo bypass fisheries enhancement would permanently remove approximately 210 acres and temporarily remove 120 acres of modeled western yellow-billed cuckoo breeding habitat in the Yolo Bypass. In addition, CM2 would permanently remove 6 acres and temporarily remove 16 acres of modeled migratory habitat for the species.

- *CM4 Tidal Natural Communities Restoration*: Site preparation and inundation would permanently remove an estimated 420 acres (175 acres of breeding habitat, 245 acres of migratory habitat) of modeled western yellow-billed cuckoo habitat.

- *CM5 Seasonally Inundated Floodplain Restoration*: Construction of setback levees to restore seasonally inundated floodplain (CM5) would permanently remove approximately 21 acres of modeled western yellow-billed cuckoo habitat consisting of 11 acres of breeding habitat and 10 acres of migratory habitat. In addition, setback levee construction would temporarily remove approximately 16 acres of modeled western yellow-billed cuckoo habitat consisting of 9 acres of modeled breeding habitat, and 7 acres of modeled migratory habitat. Based on the riparian habitat restoration assumptions, a minimum of 3,000 acres of valley/foothill riparian habitat would be restored as a component of seasonally inundated floodplain restoration actions. The actual number of acres that would be restored may differ from these estimates, depending on how closely the actual outcome of seasonally inundated floodplain restoration approximates the assumed outcome. However, restored riparian habitat is expected to support western yellow-billed cuckoo habitat once the riparian vegetation has developed habitat functions for the cuckoo.

- *CM6 Channel Margin Enhancement*: There are no expected permanent adverse direct effects on western yellow-billed cuckoo associated with channel margin enhancement (CM6). Approximately 37 acres of valley/foothill riparian habitat that could support habitat for the western yellow-billed cuckoo is expected to be restored as a component of channel margin enhancement actions along 20 miles of river and slough channels in the Delta. If an additional 20 miles of channel margin were enhanced under adaptive management, then another 37 acres of riparian habitat would be restored.
- *CM11 Natural Communities Enhancement and Management*: Habitat protection and management activities that could be implemented in protected western yellow-billed cuckoo habitats would maintain and improve the functions of the habitat over the term of the BDCP. With conditions favorable for its future establishment in the Plan Area, western yellow-billed cuckoo would be expected to benefit from the increase in protected habitat. However, habitat management- and enhancement-related activities could disturb western yellow-billed cuckoo nests if they were present near work sites. *CM11 Natural Communities Enhancement and Management* actions designed to enhance wildlife values in restored riparian habitats may result in localized ground disturbances that could temporarily remove small amounts of western yellow-billed cuckoo habitat. Ground-disturbing activities, such as removal of nonnative vegetation and road and other infrastructure maintenance activities, would be expected to have minor adverse effects on available western yellow-billed cuckoo habitat and would be expected to result in overall improvements and maintenance of western yellow-billed cuckoo habitat values over the term of the BDCP.
- Permanent and temporary habitat losses from the above CMs, would primarily consist of small, fragmented riparian stands in CZ 2–CZ 8 that do not provide high-value habitat for the species. Temporarily affected areas would be restored as riparian habitat within 1 year following completion of construction activities. Although the effects are considered temporary, the restored riparian habitat would require 5 years to several decades, for ecological succession to occur and for restored riparian habitat to functionally replace habitat that has been affected. The majority of the riparian vegetation to be temporarily removed is early- to mid-successional; therefore, the replaced riparian vegetation would be expected to have structural components comparable to the temporarily removed vegetation within the first 5 to 10 years after the initial restoration activities are complete.
- Operations and Maintenance: Postconstruction operation and maintenance of the above-ground water conveyance facilities and restoration infrastructure could result in ongoing but periodic disturbances that could affect western yellow-billed cuckoo use of the surrounding habitat. Maintenance activities would include vegetation management, levee and structure repair, and re-grading of roads and permanent work areas. These effects, however, would be reduced by AMMs and conservation actions as described below.
- Injury and Direct Mortality: Western yellow-billed cuckoo nesting has not been confirmed in the Delta for approximately 100 years. However, an unconfirmed breeding detection in 2009 in

BDCP surveys (Appendix 12C, *2009 to 2011 Bay Delta Conservation Plan EIR/EIS Environmental Data Report*) and the present of suitable habitat indicates that the species is potentially breeding in the study area, or may nest there in the future. Construction-related activities would not be expected to result in direct mortality of adult or fledged western yellow-billed cuckoo if they were present in the Plan Area, because they would be expected to avoid contact with construction and other equipment. If western yellow-billed cuckoo were to nest in the construction area, construction-related activities, including equipment operation, noise and visual disturbances could destroy nests or lead to their abandonment, resulting in mortality of eggs and nestlings. These effects would be avoided and minimized with the incorporation of *AMM23 Suisun Song Sparrow, Yellow-Breasted Chat, Least Bell's Vireo, Western Yellow-Billed Cuckoo* into the BDCP.

The following paragraphs summarize the combined effects discussed above and describe other BDCP conservation actions that offset or avoid these effects. NEPA and CEQA impact conclusions are also included.

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the effects of construction would not be adverse under NEPA and would be less than significant under CEQA. The Plan would remove 609 acres of modeled habitat for western yellow-billed cuckoo in the study area in the near-term. These effects would result from the construction of the water conveyance facilities (CM1, 34 acres of migratory habitat), and implementing other conservation measures (Yolo Bypass Fisheries Enhancement [CM2] tidal restoration [CM4], Seasonally Inundated Floodplain Restoration [CM5], 376 acres of breeding habitat, 199 acres of migratory habitat). These habitat losses would primarily consist of small, fragmented riparian stands in CZ 2–CZ 8 that do not provide high-value habitat for the species.

Typical NEPA and CEQA project-level mitigation ratios for those natural communities affected by CM1 and that are identified in the biological goals and objectives for western yellow-billed cuckoo in Chapter 3 of the BDCP would be 1:1 for restoration/creation and 1:1 protection of valley/foothill riparian habitat. Using these typical ratios would indicate that 34 acres of valley/foothill riparian habitat should be restored/created and 34 acres should be protected to mitigate for the CM1 losses of western yellow-billed cuckoo. The offsetting acreage would need to be 37 acres each of restoration and protection if the east-west transmission line alignment was selected for Alternative 4. Western yellow-billed cuckoo have been recorded at the preserve and it would be highly desirable to reroute the eastern end of this alignment to avoid crossing the riparian reserve along the Cosumnes River, as it provides valuable riparian habitat and disturbance could preclude yellow-billed cuckoo use of the area. See Mitigation Measure BIO-9, *Avoid bisecting riparian corridor with east-west transmission line*, regarding this transmission line reroute. The near-term effects of other conservation actions would remove 575 acres of modeled habitat, and therefore require 575 acres of restoration and 575 acres of protection of valley/foothill riparian using the same typical NEPA and CEQA ratios (1:1 for restoration and 1:1 for protection).

The BDCP has committed to near-term goals of protecting 750 acres and restoring 800 acres of the valley/foothill riparian natural community in the study area. To ensure that this natural community conservation benefits western yellow-billed cuckoo, the Plan's biological goals and objectives further specify that the structural diversity of riparian habitat would be increased through *CM7 Riparian Natural Community Restoration* and *CM11 Natural Communities Enhancement and Management*. In addition, at least 500 acres of mature riparian forest would be maintained in CZ 4 or CZ 7. This mature, riparian forest would be mixed with a portion of the early- to mid-successional riparian vegetation in large blocks with a minimum patch size of 50 acres and a minimum width of 100 meters, which would provide suitable nesting habitat. The protection of 750 acres of existing valley/foothill riparian forest in CZ 7 would not provide in its entirety the vegetative structure needed to support these species, because patch sizes may not be large enough to support yellow-billed cuckoo breeding habitat. However, a portion of the protected habitat would provide suitable habitat for the species. Restoration actions through CM7 and CM11 would expand the patches of existing riparian forest in order to support the species. These biological goals and objectives would inform the near-term protection and restoration efforts and represent performance standards for considering the effectiveness of restoration actions.

The acres of protection contained in the near-term Plan goals satisfy the typical mitigation ratios that would be applied to the project-level effects of CM1 and other near-term impacts. However, the restored riparian habitat would require several years (early-mid successional) and several decades (mature riparian forest), for ecological succession to occur and for restored riparian habitat to functionally replace habitat that has been affected. Because the western yellow-billed cuckoo is not known to be an established breeder in the Plan Area, the time lag in riparian restoration from BDCP actions would not be expected to have an adverse population-level effect on the species. Overall, BDCP riparian habitat restoration actions would be expected to benefit western yellow-billed cuckoo by increasing opportunities for a breeding population to become reestablished in the study area.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training*, *AMM2 Construction Best Management Practices and Monitoring*, *AMM3 Stormwater Pollution Prevention Plan*, *AMM4 Erosion and Sediment Control Plan*, *AMM5 Spill Prevention, Containment, and Countermeasure Plan*, *AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan*, *AMM7 Barge Operations Plan*, and *AMM23 Suisun Song Sparrow, Yellow-Breasted Chat, Least Bell's Vireo, Western Yellow-Billed Cuckoo*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas and disposal sites. The AMMs are described in detail in BDCP Appendix 3.C.

Late Long-Term Timeframe

The study area supports approximately 4,895 acres of modeled breeding habitat and 7,909 acres of modeled migratory habitat for western yellow-billed cuckoo. Alternative 4 as a whole would result in the permanent loss of and temporary effects to 525 acres of potential breeding habitat (1% of the potential breeding habitat in the study area) and 318 acres of migratory habitat (less than 1% of the migratory habitat in the study area). The locations of these losses would be in fragmented riparian habitat in CZs 2, 3, 4, 5, 6, 7, and 8. The Plan includes a commitment to restore or create at least 5,000 acres in CZ 4 and/or CZ 7 and protect at least 750 acres of valley/foothill riparian woodland in CZ 7. (Table 12-4-39). At least 500 acres of mature riparian forest would be maintained in large blocks (with a minimum patch size of 50 acres and a minimum width of 100 meters) to provide breeding habitat for the species.

The loss of western yellow-billed cuckoo habitat associated with Alternative 4 would represent an adverse effect as a result of habitat modification of a special-status species and potential for direct mortality in the absence of other conservation actions. The species is not an established breeder in the plan area and current presence is limited to migrants. In addition, the habitat lost would consist of small, fragmented riparian stands that would not provide high-value for the species. With habitat protection and restoration associated with CM3, CM7, and CM11, guided by biological goals and objectives and AMM1–AMM7 and AMM23, which would be in place throughout the time period any construction activity would be occurring, the effects of habitat loss and potential mortality under Alternative 4 on western yellow-billed cuckoo would not be adverse.

CEQA Conclusion: Alternative 4 (CM1–CM5, and CM11) would have both temporary and permanent impacts on western yellow-billed cuckoo and their modeled habitat, and operation of construction equipment could kill, injure or disturb individuals, if present in the study area.

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection and/or restoration in an appropriate timeframe to ensure that the impacts of construction would be less than significant. The Plan would remove 609 acres of modeled habitat for western yellow-billed cuckoo in the study area in the near-term. These impacts would result from the construction of the water conveyance facilities (CM1, 34 acres of migratory habitat), and implementing other conservation measures (Yolo Bypass Fisheries Enhancement [CM2] tidal restoration [CM4], Seasonally Inundated Floodplain Restoration [CM5], 376 acres of breeding habitat, 199 acres of migratory habitat). These habitat losses would primarily consist of small, fragmented riparian stands in CZ 2–CZ 8 that do not provide high-value habitat for the species.

Typical NEPA and CEQA project-level mitigation ratios for those natural communities impacted by CM1 and that are identified in the biological goals and objectives for western yellow-billed cuckoo in Chapter 3 of the BDCP would be 1:1 for restoration/creation and 1:1 protection of valley/foothill riparian habitat. Using these typical ratios would indicate that 34 acres of valley/foothill riparian habitat should be restored/created and 34 acres should be protected to mitigate for the CM1 losses of western yellow-billed cuckoo. The offsetting acreage would need to be 37 acres each of restoration and protection if the east-west transmission line alignment was selected for Alternative 4. Western yellow-billed cuckoo have been recorded at the preserve and it would be highly desirable to reroute the eastern end of this alignment to avoid crossing the riparian reserve along the Cosumnes River, as it provides valuable riparian habitat and disturbance could preclude yellow-billed cuckoo use of the area. See Mitigation Measure BIO-9, *Avoid bisecting riparian corridor with east-west transmission line*, regarding this transmission line reroute.

The BDCP has committed to near-term goals of protecting 750 acres and restoring 800 acres of the valley/foothill riparian natural community in the study area. To ensure that this natural community conservation benefits western yellow-billed cuckoo, the Plan's biological goals and objectives (BDCP, Chapter 3) further specify that the structural diversity of riparian habitat would be increased through *CM7 Riparian Natural Community Restoration* and *CM11 Natural Communities Enhancement* and Management. In addition, at least 500 acres of mature riparian forest would be maintained in CZ 4 or CZ 7. This mature, riparian forest would be mixed with a portion of the early- to mid-successional riparian vegetation in large blocks with a minimum patch size of 50 acres and a minimum width of 100 meters, which would provide suitable nesting habitat. The protection of 750 acres of existing valley/foothill riparian forest in CZ 7 would not provide in its entirety the vegetative structure needed to support these species, because patch sizes may not be large enough to support yellow-billed cuckoo breeding habitat. However, a portion of the protected habitat would provide suitable habitat for the species. Restoration actions through CM7 and CM11 would expand the patches of existing riparian forest in order to support the species. These biological goals and objectives would inform the near-term protection and restoration efforts and represent performance standards for considering the effectiveness of restoration actions.

The acres of protection contained in the near-term Plan goals would satisfy the typical mitigation ratios that would be applied to the project-level effects of CM1 and other near-term impacts. However, the restored riparian habitat would require several years (early-mid successional) to several decades (mature riparian forest), for ecological succession to occur and for restored riparian habitat to functionally replace habitat that has been affected. Because the western yellow-billed cuckoo is not known to be an established breeder in the Plan Area, the time lag in riparian restoration from BDCP actions would not be expected to have an adverse population-level effect on the species. Overall, BDCP riparian habitat restoration actions would be expected to benefit western yellow-billed cuckoo by increasing opportunities for a breeding population to become reestablished in the study area.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training, AMM2 Construction Best Management Practices and Monitoring, AMM3 Stormwater Pollution Prevention Plan, AMM4 Erosion and Sediment Control Plan, AMM5 Spill Prevention, Containment, and Countermeasure Plan, AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan, AMM7 Barge Operations Plan and AMM23 Suisun Song Sparrow, Yellow-Breasted Chat, Least Bell's Vireo, Western Yellow-Billed Cuckoo*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas and disposal sites. The AMMs are described in detail in BDCP Appendix 3.C.

Late Long-Term Timeframe

The study area supports approximately 4,895 acres of modeled breeding habitat and 7,909 acres of modeled migratory habitat for western yellow-billed cuckoo. Alternative 4 as a whole would result in the permanent loss of and temporary effects on 525 acres of potential breeding habitat (1% of the potential breeding habitat in the study area) and 318 acres of migratory habitat (less than 1% of the migratory habitat in the study area). The locations of these losses would be in fragmented riparian habitat in CZ 2, 3, 4, 5, 6, 7, and 8. The Plan includes a commitment to restore or create at least 5,000 acres in CZ 4 and/or CZ 7 and protect at least 750 acres of valley/foothill riparian woodland in CZ 7. (Table 12-4-39). At least 500 acres of mature riparian forest would be maintained in large blocks (with a minimum patch size of 50 acres and a minimum width of 100 meters) to provide breeding habitat for the species.

The species is not an established breeder in the plan area and current presence is limited to migrants. In addition, the habitat lost would consist of small, fragmented riparian stands that would not provide high-value habitat for the species. Habitat protection and restoration associated with CM3, CM7, and CM11, guided by biological goals and objectives and AMM1–AMM7 and AMM23, which would be in place throughout the construction time period.

Considering these protection and restoration provisions, which would provide acreages of new or enhanced habitat in amounts greater than necessary to compensate for the time lag of restoring habitats lost to construction and restoration activities, and implementation of AMM1–AMM7, and AMM23, the loss of habitat or direct mortality through implementation of Alternative 4 would not result in a substantial adverse effect through habitat modifications and would not substantially reduce the number or restrict the range of the species. Therefore, the loss of habitat or potential mortality under this alternative would have a less-than-significant impact on western yellow-billed cuckoo.

Impact BIO-96: Fragmentation of western yellow-billed cuckoo habitat as a result of constructing the water conveyance facilities

Grading, filling, contouring, and other initial ground-disturbing operations for water conveyance facilities construction may temporarily fragment modeled western yellow-billed cuckoo habitat. This could temporarily reduce the extent and functions supported by the affected habitat. Because western yellow-billed cuckoo is not currently present in the Plan Area, and because CM5 implementation would protect and create contiguous high-value riparian habitat, any such habitat fragmentation is expected to have no or minimal effect on the species.

CEQA Conclusion: Fragmentation of habitat would have a less-than-significant impact on western yellow-billed cuckoo. The habitat functions for the species would be greatly improved through the implementation of CM5, which would restore and protect large contiguous patches of riparian habitat.

Impact BIO-97: Effects on yellow-billed cuckoo associated with electrical transmission facilities

New transmission lines would increase the risk for bird-power line strikes, which could result in injury or mortality of western yellow-billed cuckoo. Because the western yellow-billed cuckoo uses riparian forests to meet all of its breeding and wintering life requisites, the species remains primarily within the canopy of riparian forests and rarely ventures into open spaces except during migration, limiting its opportunity to encounter the proposed transmission lines. As a summer resident, the species occurs in the Plan Area during periods of relatively high visibility and clear weather conditions, thus further reducing collision risk from daily use patterns or seasonal migration flights. Finally, western yellow-billed cuckoo wing shape is characterized by low wing loading and a moderate aspect ratio, making the species moderately maneuverable and presumably able to avoid collisions, especially during high-visibility conditions (BDCP Attachment 5.J-2, *Memorandum: Analysis of Potential Bird Collisions at Proposed BDCP Transmission Lines*). Transmission line poles and towers also provide perching substrate for raptors, which could result in increased predation pressure on western yellow-billed cuckoo. This would not be expected to have an adverse effect on the western yellow-billed cuckoo population.

CEQA Conclusion: The construction and presence of new transmission lines would have a less-than-significant impact on western yellow-billed cuckoo because the risk of bird-strike is considered to be minimal based on the species' rarity in the Plan Area, its proclivity to remain in the riparian canopy, its presence during periods of relative high visibility, and its overall ability to successfully negotiate around overhead wires that it may encounter. Transmission line poles and towers also provide perching substrate for raptors, which could result in increased predation pressure on western yellow-billed cuckoo. This would not be expected to have a significant impact on the western yellow-billed cuckoo population.

Impact BIO-98: Indirect effects of plan implementation on western yellow-billed cuckoo

Indirect construction-related effects: Noise and visual disturbances associated with construction-related activities could result in temporary disturbances that affect western yellow-billed cuckoo use of an estimated 1,629 acres of modeled habitat (866 acres of breeding habitat, 763 acres migratory habitat) adjacent to proposed construction areas. Indirect effects associated with construction include noise, dust, and visual disturbance caused by grading, filling, contouring, and other ground-disturbing operations outside the project footprint but within 1,300 feet from the construction edge. If western yellow-billed cuckoo were to nest in or adjacent to work areas, construction and subsequent maintenance-related noise and visual disturbances could mask calls, disrupt foraging and nesting behaviors, and reduce the functions of suitable nesting habitat for these species. These potential adverse effects would be minimized with incorporation of *AMM23 Suisun Song Sparrow, Yellow-Breasted Chat, Least Bell's Vireo, Western Yellow-Billed Cuckoo* into the BDCP. The use of mechanical equipment during water conveyance facilities construction could cause the accidental release of petroleum or other contaminants that could affect western yellow-billed cuckoo in the surrounding habitat. The inadvertent discharge of sediment or excessive dust adjacent to western yellow-billed cuckoo habitat could also affect the species. AMM1–AMM7, including *AMM2 Construction Best Management Practices and Monitoring*, in addition to *AMM23 Suisun Song Sparrow, Yellow-Breasted Chat, Least Bell's Vireo, Western Yellow-Billed Cuckoo* would minimize the likelihood of such spills from occurring and ensure that measures were in place to prevent runoff from the construction area and any adverse effects of dust on active nests.

CEQA Conclusion: The potential for noise and visual disturbance, hazardous spills, increased dust and sedimentation, and the potential impacts of operations and maintenance of the water conveyance facilities would have a less-than-significant impact on western yellow-billed cuckoo with the incorporation of AMM1–AMM7, and *AMM23 Suisun Song Sparrow, Yellow-Breasted Chat, Least Bell's Vireo, Western Yellow-Billed Cuckoo* into the BDCP.

Impact BIO-99: Periodic effects of inundation of western yellow-billed cuckoo habitat as a result of implementation of conservation components

Flooding of the Yolo Bypass from Fremont Weir operations (CM2) would increase the frequency and duration of inundation of approximately 23-37 acres of modeled western yellow-billed cuckoo nesting habitat and 21–45 acres of modeled migratory habitat. No adverse effects of increased inundation frequency on western yellow-billed cuckoo or its habitat are expected because the cuckoo breeding period is outside the period the weir would be operated. In addition, riparian vegetation supporting habitat has persisted under the existing Yolo Bypass flooding regime, and changes to frequency and inundation would be within the tolerance of these vegetation types.

Based on hypothetical floodplain restoration, CM5, implementation could result in periodic inundation of up to 142 acres of modeled western yellow-billed cuckoo habitat (28 acres of breeding habitat, 114 acres of migratory habitat). Inundation of restored floodplains is not expected to affect western yellow-billed cuckoo or its habitat adversely because the cuckoo breeding period is outside the period the floodplains would likely be inundated, and periodic inundation of floodplains is expected to restore a more natural flood regime in support of riparian vegetation types that provide nesting and migratory habitat for western yellow-billed cuckoo. The overall effect of seasonal inundation in existing riparian natural communities is likely to be beneficial for western yellow-billed cuckoo, because, historically, flooding was the main natural disturbance regulating ecological processes in riparian areas, and flooding promotes the germination and establishment of many native riparian plants.

CEQA Conclusion: Periodic effects of inundation would not have significant impacts on yellow-billed cuckoos if they were to establish as breeders in the Plan Area, because flooding is expected to occur outside of the breeding season.

White-Tailed Kite

The habitat model used to assess impacts on white-tailed kite includes breeding habitat and foraging habitat. Most white-tailed kites in the Sacramento Valley are found in oak and cottownwood riparian forests, valley oak woodlands, or other groups of trees and are usually associated with compatible foraging habitat for the species in patches greater than 1,500 square meters (Erichsen et al. 1996). Modeled foraging habitat for white-tailed kite consists of pasture and hay crops, compatible row and grain crops and natural vegetation such as seasonal wetlands and annual grasslands (Erichsen et al. 1995).

Construction and restoration associated with Alternative 4 conservation measures would result in both temporary and permanent losses of white-tailed kite modeled habitat as indicated in Table 12-4-40. The majority of the losses would take place over an extended period of time as tidal marsh is restored in the study area. Although restoration for the loss of nesting and foraging habitat would be initiated in the same timeframe as the losses, it would take years (for foraging habitat) and 1 or more decades (for nesting habitat) for restored habitats to replace the functions of habitat lost. This time lag between impacts and restoration of habitat function would be minimized by specific tree planting requirements of *AMM18 Swainson's Hawk and White-Tailed Kite*, including number of plantings, location, species of trees, and monitoring, associated with restoration success. Furthermore, restoration to offset impacts on nesting habitat within the first 10 years would be initiated within 18 months of Plan approval. Full implementation of Alternative 4 would restore or create 5,000 acres of valley/foothill riparian forest, and protect 750 acres of existing valley/foothill riparian forest, portions of which would provide nesting structures for white-tailed kites (i.e., large mature trees). The BDCP contains a commitment to restore 800 acres and protect 750 acres of riparian habitat in the first 10 years. In addition, temporarily affected riparian areas would be restored as riparian habitat within 1 year following completion of construction activities. The loss of foraging habitat would be mitigated by the conservation of 45,405 acres of cultivated lands and a contiguous matrix of an additional 10,889 acres of grassland, vernal pool and alkali seasonal wetland complex. The restoration of 55,000 acres tidal natural communities and the protection of 6,500 acres of managed wetlands would also provide foraging habitat for white-tailed kite. As explained below, with the restoration or protection of these amounts of habitat, impacts on white-tailed kite would not be adverse for NEPA purposes and would be less than significant for CEQA purposes.

Table 12-4-40. Changes in White-Tailed Kite Modeled Habitat Associated with Alternative 4 (acres)[a]

	Conservation Measure[b]	Habitat Type	Permanent		Temporary		Periodic[d]	
			NT	LLT	NT	LLT	Yolo	Floodplain
Habitat Affected[c]	CM1	Breeding	23	23	17	17	NA	NA
		Foraging	3,186	3,186	1,184	1,184	NA	NA
	Total Impacts CM1		**3,209**	**3,209**	**1,201**	**1,201**		
	CM2–CM18	Breeding	444	640	134	167	45–79	229
		Foraging	9,914	51,044	516	1,478	3,271–7,372	7,423
	Total Impacts CM2–CM18		**10,358**	**51,684**	**650**	**1,645**	**3,319–7,451**	**7,653**

	TOTAL IMPACTS	**13,567**	**54,893**	**1,851**	**2,846**	**3,319–7,451**	**7,653**
Habitat Restored/ Created[e]	CM3 alkali seasonal wetland	58	72	NA	NA	NA	NA
	CM4 tidal wetland	13,800	55,000	NA	NA	NA	NA
	CM7 riparian	800	5,000	NA	NA	NA	NA
	CM8 grassland	1,140	2,000	NA	NA	NA	NA
	CM9 vernal pool	40	67	NA	NA	NA	NA
	Total Restoration/Creation	**15,838**	**62,139**				
Habitat Protected[e]	CM3 riparian	750	NA	NA	NA	NA	NA
	CM3 grassland	2,000	8,000	NA	NA	NA	NA
	CM3 alkali seasonal wetland	120	150	NA	NA	NA	NA
	CM3 vernal pool	400	600	NA	NA	NA	NA
	CM3 cultivated lands (non-rice)	14,600	45,405	NA	NA	NA	NA
	CM3 managed wetlands	3,200	6,500	NA	NA	NA	NA
	Total Protection	**21,070**	**60,655**				

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late long-term timeframes.

[b] See discussion below for a description of applicable CMs.

[c] LLT acreages are a summation of effects that would occur in the near-term, early long-term and late long-term timeframes. The LLT acreages represent the total amount of habitat that would be affected over the 50-year life of the BDCP and do not reflect habitat increases that would result from restoration, creation and protection activities.

[d] Periodic effects were estimated for the late long-term only. Yolo periodic impacts are presented as a range based on different flow regimes at the proposed notch in Fremont Weir.

[e] Restored/created and protected habitat acreages represent planned conservation activities that would be implemented over the lifetime of the BDCP (see BDCP Chapter 3, *Conservation Strategy*, for specifics).

NT = near-term
LLT = late long-term
NA = not applicable

Impact BIO-100: Loss or conversion of habitat for and direct mortality of white-tailed kite

Alternative 4 conservation measures would result in the combined permanent and temporary loss of up to 57,737 acres of modeled habitat for white-tailed kite (Table 12-4-40). Conservation measures that would result in these losses are Water Facilities and Operation (CM1) (which would involve construction of conveyance facilities and transmission lines and establishment and use of borrow and spoil areas), Yolo Bypass fisheries enhancement (CM2), tidal habitat restoration (CM4), floodplain restoration (CM5), channel margin enhancement (CM6), grassland restoration (CM8), vernal pool and wetland restoration (CM9), and construction of conservation hatcheries (CM18). Habitat enhancement and management activities (CM11), which include ground disturbance or removal of nonnative vegetation, could result in local habitat effects. In addition, maintenance activities associated with the long-term operation of the water conveyance facilities and other BDCP physical facilities could affect white-tailed kite modeled habitat. Each of these individual activities is described below. A summary statement of the combined impacts and NEPA and CEQA conclusions follows the individual conservation measure discussions.

- *CM1 Water Facilities and Operation*: Construction of Alternative 4 water conveyance facilities would result in the combined permanent and temporary loss of up to 4,410 acres of modeled white-tailed kite habitat, composed of 40 acres of breeding habitat and 4,370 acres of foraging habitat (Table 12-4-40). Activities that would impact modeled White-tailed kite habitat consist of tunnel, forebay, and intake construction, temporary access roads, and construction of transmission lines. Of the 40 acres of nesting habitat that would be removed for the construction of the conveyance facilities, 23 acres would be a permanent loss and 17 acres would be a temporary loss of habitat. Most of the permanent loss would occur where Intakes 1–5 impact the Sacramento River's east bank between Freeport and Courtland. The riparian areas here are very small patches, some dominated by valley oak and others by nonnative trees. Temporary losses would occur where pipelines cross Snodgrass Slough and other small waterways east of the Sacramento River, and where temporary work areas surround intake sites. The riparian habitat in these areas is also composed of very small patches or stringers bordering waterways, which are composed of valley oak and scrub vegetation. Of the 4,573 acres of foraging habitat that would be removed for the construction of the conveyance facilities, 3,276 acres would be a permanent loss and 1,346 acres would be a temporary loss of foraging habitat. Impacts from CM1 would occur in the central delta in CZ 3, CZ 4, CZ 5, CZ 6, and CZ 8. Refer to the Terrestrial Biology Map Book for a detailed view of Alternative 4 construction locations.

  There would be an 8 acre increase in the combined permanent and temporary loss of white-tailed kite nesting habitat, and a 110 acre decrease in the loss of migratory habitat (resulting in a net 102 acre decrease in the loss of modeled habitat) associated with the construction of the east-west transmission line for the Alternative 4 water conveyance facility rather than the north-south transmission line.

- *CM2 Yolo Bypass Fisheries Enhancement:* Construction of the Yolo bypass fisheries enhancement would result in the permanent removal of 214 acres of nesting habitat and 898 acres of foraging habitat for white-tailed kite in the late long-term. In addition, CM2 would result in the temporary loss of 134 acres of nesting habitat and 516 acres of foraging habitat for the species. Impacts from CM2 would occur in the near-term timeframe. Activities through CM2 could involve excavation and grading in valley/foothill riparian areas to improve passage of fish through the bypasses. Most of the riparian losses would occur at the north end of Yolo Bypass where major fish passage improvements are planned. Excavation to improve water movement in the Toe Drain and in the Sacramento Weir would also remove white-tailed kite habitat.

- *CM4 Tidal Natural Communities Restoration*: Site preparation and inundation from CM4 would permanently remove an estimated 384384 acres of breeding habitat. In addition, 40,163 acres of foraging habitat would be converted as a result of tidal restoration. However, the resulting 45,405 acres of tidal natural communities would also provide foraging habitat for the species. Because the species is highly mobile and wide-ranging, habitat fragmentation is not expected to reduce the use of remaining cultivated lands or preclude access to surrounding lands. However, the conversion of cultivated lands to tidal wetlands over fairly broad areas within the tidal restoration areas could result in the removal or abandonment of nesting territories that occur within or adjacent to the restoration areas. Depending on the extent and value of remaining habitat, this could reduce the local nesting population.

- *CM5 Seasonally Inundated Floodplain Restoration* and *CM7 Riparian Natural Community Restoration*: Construction of setback levees to restore seasonally inundated floodplain and riparian restoration actions (CM5) would permanently remove approximately 5,730 acres of modeled white-tailed kite habitat consisting of 42 acres of breeding habitat and 5,688 acres of foraging habitat. In addition, levee construction and restoration actions would temporarily remove approximately 993 acres of modeled white-tailed kite habitat consisting of 33 acres of modeled breeding habitat, and 960 acres of modeled foraging habitat. Based on the riparian habitat restoration assumptions (CM7), of the 5,000 acres of valley/foothill riparian habitat restored, a minimum of 3,000 acres would be restored as a component of seasonally inundated floodplain restoration actions.

- *CM6 Channel Margin Enhancement*: Construction-related activities for channel margin enhancement (CM6) would be located along levees that do not likely presently support white-tailed kite habitat. Approximately 37 acres of valley/foothill riparian habitat are expected to be restored as a component of channel margin enhancement actions along 20 miles of river and slough channels in the Delta. Another 37 acres of riparian habitat would be restored if 20 more miles of channel margin are enhanced under adaptive management. Some of the riparian habitat to be restored as part of channel margin enhancement would be expected to support nesting habitat for white-tailed kite.

- *CM8 Grassland Natural Community Restoration*: Restoration of grassland (CM8) is expected to be implemented on agricultural lands and would result in the conversion of 1,849 acres of white-tailed kite agricultural foraging habitat to grassland foraging habitat in CZs 1, 8, and/or 11. If agricultural lands supporting higher value foraging habitat than the restored grassland were removed, there would be a loss of white-tailed kite foraging habitat value.

- *CM10 Nontidal Marsh Restoration*: Restoration and creation of nontidal freshwater marsh (CM10) would result in the permanent conversion of 1,440 acres of cultivated lands to nontidal marsh in CZ 2 and CZ 4. This would not result in a loss of foraging habitat as white-tailed kite Small patches of riparian vegetation that support White-tailed kite nesting habitat may develop along the margins of restored nontidal marsh restoration would also provide foraging habitat for the species.

- *CM11 Natural Communities Enhancement and Management*: Habitat management- and enhancement-related activities could disturb white-tailed kite nests if they were present near work sites. A variety of habitat management actions included in *CM11 Natural Communities Enhancement and Management* that are designed to enhance wildlife values in BDCP-protected habitats may result in localized ground disturbances that could temporarily remove small amounts of white-tailed kite habitat and reduce the functions of habitat until restoration is complete. Ground-disturbing activities, such as removal of nonnative vegetation and road and other infrastructure maintenance, are expected to have minor effects on available white-tailed kite habitat and are expected to result in overall improvements to and maintenance of habitat values over the term of the BDCP. These effects cannot be quantified, but are expected to be minimal and would be avoided and minimized by the AMMs listed below.

- *CM18 Conservation Hatcheries*: Construction for conservation hatcheries could result in the permanent removal of 35 acres of foraging grassland habitat for White-tailed kite in the Yolo Bypass area (CZ 2). The specifications and operations of this facility have not been developed, nor has the facility location been specifically determined, although it is expected to be located within the study area in the vicinity of Rio Vista.

- Permanent and temporary habitat losses from the above conservation measures would primarily consist of small, fragmented riparian stands in CZs 2, 3, 4, 5, 6, 7, and 8. Temporarily affected areas would be restored as riparian habitat within 1 year following completion of construction activities. Although the effects are considered temporary, the restored riparian habitat would require 1 to several decades to functionally replace habitat that has been affected and for trees to attain sufficient size and structure suitable for nesting by White-tailed kites. The restored riparian habitats would be designed to provide future nesting habitat in large contiguous patches over the term of the BDCP in order to increase nesting opportunities for the species. The functions of agricultural and grassland communities that provide foraging habitat for White-tailed kite are expected to be restored relatively quickly.

- Operations and Maintenance: Postconstruction operation and maintenance of the above-ground water conveyance facilities and restoration infrastructure could result in ongoing but periodic disturbances that could affect white-tailed kite use of the surrounding habitat. Maintenance activities would include vegetation management, levee and structure repair, and re-grading of roads and permanent work areas. These effects, however, would be reduced by AMMs and conservation actions as described below.
- Injury and Direct Mortality: Construction-related activities would not be expected to result in direct mortality of adult or fledged white-tailed kite if they were present in the Plan Area, because they would be expected to avoid contact with construction and other equipment. However, if white-tailed kite were to nest in the construction area, construction-related activities, including equipment operation, noise and visual disturbances, could affect nests or lead to their abandonment, potentially resulting in mortality of eggs and nestlings. These effects would be avoided and minimized with the incorporation of *AMM18 Swainson's Hawk and White-Tailed Kite* into the BDCP.

The following paragraphs summarize the combined effects discussed above and describe other BDCP conservation actions that offset or avoid these effects. NEPA and CEQA impact conclusions are also included.

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the effect of construction would not be adverse under NEPA. The Plan would remove 618 acres of breeding habitat and convert or remove 13,184 acres of foraging habitat for white-tailed kite in the study area in the near-term. These effects would result from the construction of the water conveyance facilities (CM1, 40 acres of breeding and 4,370 acres of foraging habitat), and implementing other conservation measures (*CM2 Yolo Bypass Fisheries Enhancement*, *CM4 Tidal Natural Communities Restoration*, *CM5 Seasonally Inundated Floodplain Restoration*, *CM8 Grassland Natural Community Restoration*, *CM18 Conservation Hatcheries*—578 acres of breeding and 10,430 acres of foraging habitat).

Typical NEPA and CEQA project-level mitigation ratios for those natural communities affected by CM1 and that are identified in the biological goals and objectives for white-tailed kite in Chapter 3 of the BDCP would be 1:1 for restoration/creation and 1:1 protection of valley/foothill riparian habitat for breeding habitat, and 1:1 for restoration/creation and 1:1 protection for foraging habitat. Using these typical ratios would indicate that 40 acres of breeding habitat should be restored/created and 40 acres should be protected to mitigate for the CM1 losses of white-tailed kite breeding habitat. In addition, 4,370 acres of foraging habitat should be restored/created and an additional 4,370 acres should be protected to mitigate for the CM1 losses of white-tailed kite foraging habitat. The offsetting acreage would need to be 48 acres each of restoration and protection of breeding habitat if the east-west transmission line alignment was selected for Alternative 4. In addition, 4,260 acres of foraging habitat would need to be restored and another 4,620 acres would need to be protected if the east-west transmission line was selected. The near-term effects of other conservation actions would remove 578 acres of modeled breeding habitat, and therefore require 578 acres of restoration and 578 acres of protection of breeding habitat. Similarly, the near-term effects of other conservation actions would remove or convert 10,430 acres of modeled foraging habitat, and therefore require 10,430 acres of restoration and 10,430 acres of protection of foraging habitat using the same typical NEPA and CEQA ratios (1:1 for restoration and 1:1 for protection of breeding habitat; 1:1 for restoration and 1:1 for protection of foraging habitat).

The BDCP has committed to near-term goals of protecting 750 acres and restoring 800 acres of the valley/foothill riparian natural community; protecting 2,000 acres and restoring 1,140 acres of grassland natural community; protecting 120 acres and restoring 58 acres of alkali seasonal wetland complex; protecting 400 acres and restoring 40 acres of vernal pool complex; protecting 3,600 acres of managed wetlands, and protecting 14,600 acres of cultivated lands in the study area. In addition, 13,800 acres of tidal natural communities would be restored. Temporarily disturbed habitat would be restored following the completion of construction.

The protection and restoration of nesting habitat is essential for the conservation of white-tailed kite in the Plan Area. White-tailed kite is excluded from narrow bands of riparian vegetation by Swainson's hawks and therefore requires wide patches of nesting habitat where its range overlaps with Swainson's hawk. Riparian restoration actions through *CM7 Riparian Natural Communities Restoration* and *CM11 Natural Communities Enhancement and Management* would expand the patches of existing riparian forest in order to improve nesting habitat for the species in the Plan Area and the majority of riparian restoration would be within 5 to 8 miles of suitable foraging habitat. All protected habitat would be managed under *CM11 Natural Communities Enhancement and Management* to increase small mammal and insect prey populations on protected lands, improving the foraging value of these natural communities. To ensure conservation of breeding and foraging habitat for white-tailed kite, the Plan's species specific biological goals and objectives (BDCP Chapter 3, *Conservation Strategy*) further specify that through *CM11 Natural Communities Enhancement and Management*, small, but essential habitats for white-tailed kite that occur within cultivated lands, such as tree rows along field borders or roads, or small clusters of trees in farmyards or rural residences would be protected. These biological goals and objectives would inform the near-term protection and restoration efforts and represent performance standards for considering the effectiveness of restoration actions.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training*, *AMM2 Construction Best Management Practices and Monitoring*, *AMM3 Stormwater Pollution Prevention Plan*, *AMM4 Erosion and Sediment Control Plan*, *AMM5 Spill Prevention, Containment, and Countermeasure Plan*, *AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan*, *AMM7 Barge Operations Plan*, and *AMM18 Swainson's Hawk and White-Tailed Kite*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas and disposal sites. The AMMs are described in detail in BDCP Appendix 3.C.

The near-term loss of 618 acres of nesting habitat would not have an adverse effect on the species because the impacted habitat is primarily lower value habitat, and white-tailed kite would persist in other nesting habitat available within the study area until restored nesting habitat becomes functional. In addition, approximately 230 acres of the nesting habitat would be impacted as a result of *CM4 Tidal Natural Communities Restoration*. Trees would not be actively removed but tree mortality would be expected over time as areas became tidally inundated. Restoration projects under CM4 would be prioritized in areas where tidal habitat restoration would not adversely affect mature riparian stands in the near-term time period.

The acres of protection contained in the near-term Plan goals satisfy the typical mitigation ratios that would be applied to the project-level effects of CM1 on white-tailed kite nesting and foraging habitat. The 800 acres of riparian habitat restoration would be initiated in the near-term to offset the loss of 618 acres of modeled nesting habitat. However, it would take 1 to several decades for restored habitat to functionally replace habitat that has been affected and for the trees to attain sufficient size and structure suitable for nesting by white-tailed kites. This time lag between the removal and restoration of nesting habitat could have a substantial impact on white-tailed kite in the near-term time period. AMM18 would reduce the impact of near-term loss of nesting habitat by requiring three 5-gallon trees be planted for each potential nest tree (i.e., trees that are large enough to be potential habitat) expected to be removed during the near-term period. Trees would be planted in clumps of at least three on cultivated lands as part of CM11 or would be incorporated into riparian restoration under CM7. To further offset near-term impacts, under AMM18, a variety of native tree species with differing growth rates would be planted. This variety would ensure that nesting habitat is available quickly (approximately 10 years for cottonwoods and willows) and in the longer term (valley oaks, black walnuts, and sycamores). Nesting tree replacement planting would occur within 18 months of Plan approval and a monitoring and maintenance plan described in CM11 would ensure the establishment and survival of planted trees. For all of these reasons, Alternative 4 would not have a substantial adverse effect on white-tailed kite in the near-term timeframe, either through direct mortality or through habitat modifications.

Late Long-Term Timeframe

The study area supports approximately 14,515 acres of modeled breeding habitat and 499,323 acres of modeled foraging habitat for white-tailed kite. Alternative 4 as a whole would result in the permanent loss of and temporary effects on 847 acres of potential breeding habitat (6% of the potential breeding habitat in the study area) and the loss or conversion of 56,890 acres of foraging habitat (11% of the foraging habitat in the study area). The Plan includes a commitment to restore or create at least 5,000 acres of valley/foothill riparian woodland in CZ 4 and/or CZ 7 and protect at least 750 acres of valley/foothill riparian woodland in CZ 7. In addition, The Plan would restore or create at least 2,000 acres of grassland in CZ 1, 8 and 11 protect 8,000 acres of grassland (with at least 2,000 acres protected in CZ 1, at least 1,000 acres in CZ 8, at least 2,000 acres protected in CZ 11, and the remainder distributed throughout CZs 1, 2, 4, 5, 7, 8, and 11. A total of 72 acres of alkali seasonal wetland and 67 acres of vernal pool natural communities would be restored and 150 acres of alkali seasonal wetland and 600 acres of vernal pool natural communities would be protected. The restoration of 55,000 acres of tidal natural communities would provide foraging habitat for the white-tailed kite. Finally, 45,405 acres of cultivated lands and 6,500 acres of managed wetlands would also be protected (Table 12-4-40). The protection and restoration of nesting habitat is essential for the conservation of white-tailed kite in the Plan Area. white-tailed kite is excluded from narrow bands of riparian vegetation by Swainson's hawks and therefore requires wide patches of nesting habitat where its range overlaps with Swainson's hawk. Riparian restoration actions through CM7 and CM11 would expand the patches of existing riparian forest in order to improve nesting habitat for the species in the Plan Area and the majority of riparian restoration would be within 5–8 miles of suitable foraging habitat. All protected habitat would be managed under *CM11 Natural Communities Enhancement and Management* to increase small mammal and insect prey populations on protected lands, enhancing the foraging value of these natural communities. To ensure conservation of breeding and foraging habitat for white-tailed kite, the Plan's species specific biological goals and objectives further specify that through *CM11 Natural Communities Enhancement and Management*, small, but essential habitats for white-tailed kite that occur within cultivated lands, such as tree rows along field borders or roads, or small clusters of trees in farmyards or rural residences would be protected.

The loss of white-tailed kite habitat associated with Alternative 4 would represent an adverse effect as a result of habitat modification of a special-status species and potential for direct mortality in the absence of other conservation actions. Approximately 95% of the foraging habitat effects involve conversion from one habitat type to another alternate form of suitable (tidal) foraging habitat for white-tailed kite. With habitat protection and restoration associated with CM3, CM5, CM7, CM8, CM9, and CM11, guided by biological goals and objectives and AMM1–AMM7 and AMM18, which would be in place throughout the construction time period, the effects of habitat loss and potential mortality under Alternative 4 on White-tailed kite would not be adverse under NEPA.

CEQA Conclusion: Alternative 4 (CM1–CM18) would have both temporary and permanent impacts on white-tailed kite and their modeled habitat and operation of construction equipment could injure or disturb individuals, if present in the study area.

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the effect of construction would be less than significant under CEQA. The Plan would remove 618 acres of breeding habitat and convert or remove 13,184 acres of foraging habitat for white-tailed kite in the study area in the near-term. These impacts would result from the construction of the water conveyance facilities (CM1, 40 acres of breeding and 4,370 acres of foraging habitat), and implementing other conservation measures (*CM2 Yolo Bypass Fisheries Enhancement*, *CM4 Tidal Natural Communities Restoration*, *CM5 Seasonally Inundated Floodplain Restoration*, *CM8 Grassland Natural Community Restoration*, *CM18 Conservation Hatcheries*—578 acres of breeding and 10,430 acres of foraging habitat).

Typical NEPA and CEQA project-level mitigation ratios for those natural communities impacted by CM1 and that are identified in the biological goals and objectives for white-tailed kite in Chapter 3 of the BDCP would be 1:1 for restoration/creation and 1:1 protection of valley/foothill riparian habitat for breeding habitat, and 1:1 for restoration/creation and 1:1 protection for foraging habitat. Using these typical ratios would indicate that 40 acres of breeding habitat should be restored/created and 40 acres should be protected to mitigate for the CM1 losses of white-tailed kite breeding habitat. In addition, 4,370 acres of foraging habitat should be restored/created and 4,370 acres should be protected to mitigate for the CM1 losses of white-tailed kite foraging habitat. The offsetting acreage would need to be 48 acres each of restoration and protection of breeding habitat if the east-west transmission line alignment was selected for Alternative 4. In addition, 4,260 acres of foraging habitat would need to be restored and an additional 4,260 acres would need to be protected if the east-west transmission line was selected. The near-term effects of other conservation actions would remove 578 acres of modeled breeding habitat, and therefore require 578 acres of restoration and 578 acres of protection of breeding habitat. Similarly, the near-term effects of other conservation actions would remove or convert 10,430 acres of modeled foraging habitat, and therefore require

10,430 acres of restoration and 10,430 acres of protection of foraging habitat using the same typical NEPA and CEQA ratios (1:1 for restoration and 1:1 for protection of breeding habitat; 1:1 for restoration and 1:1 for protection of foraging habitat).

The BDCP has committed to near-term goals of protecting 750 acres and restoring 800 acres of the valley/foothill riparian natural community; protecting 2,000 acres and restoring 1,140 acres of grassland natural community; protecting 120 acres and restoring 58 acres of alkali seasonal wetland complex; protecting 400 acres and restoring 40 acres of vernal pool complex; protecting 3,600 acres of managed wetlands, and protecting 14,600 acres of cultivated lands in the study area. In addition, 13,800 acres of tidal natural communities would be restored. Temporarily disturbed habitat would be restored following the completion of construction.

The protection and restoration of nesting habitat is essential for the conservation of white-tailed kite in the Plan Area. White-tailed kite is excluded from narrow bands of riparian vegetation by Swainson's hawks and therefore requires wide patches of nesting habitat where its range overlaps with Swainson's hawk. Riparian restoration actions through *CM7 Riparian Natural Communities Restoration* and *CM11 Natural Communities Enhancement and Management* would expand the patches of existing riparian forest in order to improve nesting habitat for the species in the Plan Area and the majority of riparian restoration would be within 5–8 miles of suitable foraging habitat. All protected habitat would be managed under *CM11 Natural Communities Enhancement and Management* to increase small mammal and insect prey populations on protected lands, improving the foraging value of these natural communities. To ensure conservation of breeding and foraging habitat for white-tailed kite, the Plan's species specific biological goals and objectives (BDCP Chapter 3, *Conservation Strategy*) further specify that through *CM11 Natural Communities Enhancement and Management*, small, but essential habitats for white-tailed kite that occur within cultivated lands, such as tree rows along field borders or roads, or small clusters of trees in farmyards or rural residences would be protected. These biological goals and objectives would inform the near-term protection and restoration efforts and represent performance standards for considering the effectiveness of restoration actions.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training*, *AMM2 Construction Best Management Practices and Monitoring*, *AMM3 Stormwater Pollution Prevention Plan*, *AMM4 Erosion and Sediment Control Plan*, *AMM5 Spill Prevention, Containment, and Countermeasure Plan*, *AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan*, *AMM7 Barge Operations Plan*, and *AMM18 Swainson's Hawk and White-Tailed Kite*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas and disposal sites. The AMMs are described in detail in BDCP Appendix 3.C.

The near-term loss of 618 acres of nesting habitat would not be expected to have a significant impact on the species because the impacted habitat would be primarily lower value habitat and white-tailed kite would persist in other nesting habitat available within the study area until restored nesting habitat was functional. In addition, approximately 230 acres of the nesting habitat would be impacted as a result of *CM4 Tidal Natural Communities Restoration*. Trees would not be actively removed but tree mortality would be expected over time as areas became tidally inundated. Restoration projects under CM4 would be prioritized in areas where tidal habitat restoration would not adversely affect mature riparian stands in the near-term time period.

The acres of protection contained in the near-term Plan goals satisfy the typical mitigation ratios that would be applied to the project-level effects of CM1 on white-tailed kite nesting and foraging habitat. The 800 acres of riparian habitat restoration would be initiated in the near-term to offset the loss of 618 acres of modeled nesting habitat. However, it would take 1 to several decades to for restored habitat to functionally replace habitat that has been affected and for the trees to attain sufficient size and structure suitable for nesting by white-tailed kites. This time lag between the removal and restoration of nesting habitat could have a substantial impact on white-tailed kite in the near-term time period. AMM18 would reduce the impact of near-term loss of nesting habitat by requiring three 5-gallon trees be planted for each potential nest tree (i.e., trees that are large enough to provide potential habitat) expected to be removed during the near-term period. Trees would be planted in clumps of at least three on cultivated lands as part of CM11 or would be incorporated into riparian restoration under CM7. To further offset near-term impacts, under AMM18, a variety of native tree species with differing growth rates would be planted. This variety would ensure that nesting habitat is available quickly (approximately 10 years for cottonwoods and willows) and in the longer term (valley oaks, black walnuts, and sycamores). Nesting tree replacement planting would occur within 18 months of Plan approval and a monitoring and maintenance plan described in CM11 would ensure the establishment and survival of planted trees. For all of these reasons, Alternative 4 would not have a substantial adverse effect on white-tailed kite in the near-term timeframe, either through direct mortality or through habitat modifications. The impact would be less than significant.

Late Long-Term Timeframe

The Plan Area supports approximately 14,515 acres of modeled breeding habitat and 499,323 acres of modeled foraging habitat for white-tailed kite. Alternative 4 as a whole would result in the permanent loss of and temporary effects on 847 acres of potential breeding habitat (6% of the potential breeding habitat in the study area) and the loss or conversion of 56,890 acres of foraging habitat (11% of the foraging habitat in the Plan Area). The Plan includes a commitment to restore or create at least 5,000 acres of valley/foothill riparian woodland in CZ 4 and/or CZ 7 and protect at least 750 acres of valley/foothill riparian woodland in CZ 7. In addition, The Plan would restore or create at least 2,000 acres of grassland in CZ 1, 8, and 11 protect 8,000 acres of grassland (with at least 2,000 acres protected in CZ 1, at least 1,000 acres in CZ 8, at least 2,000 acres protected in CZ 11, and the remainder distributed throughout CZ 1, 2, 4, 5, 7, 8, and 11 in the study area. 72 acres of alkali seasonal wetland and 67 acres of vernal pool natural communities would be restored and 150 acres of alkali seasonal wetland and 600 acres of vernal pool natural communities would be protected. The restoration of 55,000 acres of tidal natural communities would provide foraging habitat for the white-tailed kite. Finally, 45,405 acres of cultivated lands and 6,500 acres of managed wetlands would also be protected (Table 12-4-40). The protection and restoration of nesting habitat is essential for the conservation of white-tailed kite in the Plan Area. White-tailed kite is excluded from narrow bands of riparian vegetation by Swainson's hawks and therefore requires wide patches of nesting habitat where its range overlaps with Swainson's hawk. Riparian restoration actions through CM7 and CM11 would expand the patches of existing riparian forest in order to improve nesting habitat for the species in the Plan Area and the majority of riparian restoration would be within 5 to 8 miles of suitable foraging habitat. All protected habitat would be managed under *CM11 Natural Communities Enhancement and Management* to increase small mammal and insect prey populations on protected lands, enhancing the foraging value of these natural communities. To ensure conservation of breeding and foraging habitat for white-tailed kite, the Plan's species specific biological goals and objectives (BDCP, Chapter 3) further specify that through *CM11 Natural Communities Enhancement and Management*, small, but essential habitats for white-tailed kite that occur within cultivated lands, such as tree rows along field borders or roads, or small clusters of trees in farmyards or rural residences would be protected.

Considering these protection and restoration provisions, which would provide acreages of new or enhanced habitat in amounts greater than necessary to compensate for the time lag of restoring riparian and foraging habitats lost to construction and restoration activities, and implementation of AMM1–AMM7, and AMM18, the loss of habitat or direct mortality through implementation of Alternative 4 would not result in a substantial adverse effect through habitat modifications and would not substantially reduce the number or restrict the range of the species. In particular, 95% of the loss of foraging habitat effects involve the conversion from one habitat type to another form of suitable foraging habitat. Therefore, the loss of habitat or potential mortality under this alternative would have a less-than-significant impact on White-tailed kite.

Impact BIO-101: Effects on white-tailed kite associated with electrical transmission facilities

New transmission lines would increase the risk that white-tailed kites could be subject to power line strikes and/or electrocution, which could result in injury or mortality of individuals. This species would be at low risk of bird strike mortality based on its general maneuverability, its keen eyesight, and lack of flocking behavior (BDCP Attachment 5.J-2*, Memorandum: Analysis of Potential Bird Collisions at Proposed BDCP Transmission Lines*). *AMM20 Greater Sandhill Crane*, would further reduce any potential adverse effects.

CEQA Conclusion: New transmission lines would increase the risk for white-tailed kite power line strikes and/or electrocution. However, the species would be at a low risk of bird strike mortality based on its general maneuverability, its keen eyesight and lack of flocking behavior. *AMM20 Greater Sandhill Crane*, would further reduce any potential impact of the construction of new transmission lines on white-tailed kite to a less-than-significant level.

Impact BIO-102: Indirect effects of plan implementation on white-tailed kite

Indirect construction-related effects: There are 1,276 acres of white-tailed kite breeding habitat within the vicinity of proposed construction areas that could be indirectly affected by construction activities. Indirect effects associated with construction include noise, dust, and visual disturbance caused by grading, filling, contouring, and other ground-disturbing operations outside the project footprint but within 1,300 feet from the construction edge. If white-tailed kite were to nest in or adjacent to work areas, construction and subsequent maintenance-related noise and visual disturbances could mask calls, disrupt foraging and nesting behaviors, and reduce the functions of suitable nesting habitat for these species. *AMM18 Swainson's Hawk and White-Tailed Kite* would require preconstruction surveys, and if detected, 200 yard no disturbance buffers would be established around active nests. The use of mechanical equipment during water conveyance facilities construction could cause the accidental release of petroleum or other contaminants that could affect white-tailed kite in the surrounding habitat. The inadvertent discharge of sediment or excessive dust adjacent to white-tailed kite habitat could also affect the species. AMM1–AMM7, including *AMM2 Construction Best Management Practices and Monitoring*, would minimize the likelihood of such spills and ensure that measures are in place to prevent runoff from the construction area and negative effects of dust on active nests.

Methylmercury Exposure: Covered activities have the potential to exacerbate bioaccumulation of mercury in avian species, including white-tailed kite. Marsh (tidal and nontidal) and floodplain restoration also have the potential to increase exposure to methylmercury. Mercury is transformed into the more bioavailable form of methylmercury in aquatic systems, especially areas subjected to regular wetting and drying such as tidal marshes and flood plains (Alpers et al. 2008). Thus, BDCP restoration activities that create newly inundated areas could increase bioavailability of mercury (see BDCP Chapter 3, *Conservation Strategy*, for details of restoration). Increased methylmercury associated with natural community and floodplain restoration may indirectly affect white-tailed kite (see BDCP Appendix 5.D, *Contaminants*). However, the potential mobilization or creation of methylmercury within the Plan Area varies with site-specific conditions and would need to be assessed at the project level. *CM12 Methylmercury Management* includes provisions for project-specific Mercury Management Plans. Site-specific restoration plans that address the creation and mobilization of mercury, as well as monitoring and adaptive management as described in CM12 would be available to address the uncertainty of methylmercury levels in restored tidal marsh and potential impacts on white-tailed kite.

CEQA Conclusion: Impacts of noise, the potential for hazardous spills, increased dust and sedimentation, and operations and maintenance of the water conveyance facilities would be less than significant with the implementation of *AMM18 Swainson's Hawk and White-Tailed Kite*, and AMM1–AMM7. The implementation of tidal natural communities restoration or floodplain restoration could result in increased exposure of white-tailed kite to methylmercury. However, it is unknown what concentrations of methylmercury are harmful to this species. *CM12 Methylmercury Management* include provisions for Project-specific Mercury Management Plans. Site-specific restoration plans that address the creation and mobilization of mercury, as well as monitoring and adaptive management as described in CM12 would better inform potential impacts and address the uncertainty of methylmercury levels in restored tidal marsh in the study area on white-tailed kite.

Impact BIO-103: Periodic effects of inundation of white-tailed kite habitat as a result of implementation of conservation components

Flooding of the Yolo Bypass from Fremont Weir operations (related to *CM2 Yolo Bypass Fisheries Enhancement*) would increase the frequency and duration of inundation on approximately 45–79 acres of modeled white-tailed kite nesting habitat and 3,271–7,372 acres of modeled white-tailed kite foraging habitat (Table 12-4-40). During inundation years, affected cultivated lands and grassland would not be available as foraging habitat until prey populations have re-inhabited inundated areas. This would result in temporary periodic reduction in availability of foraging habitat. If late-season Fremont Weir operations were to preclude the planting of some crop types, there could be a further loss of foraging habitat value if the crop type that would have been planted would provide greater foraging habitat value than the fallowed fields. No known white-tailed kite nest sites would be affected, and increased periodic flooding is not expected to cause any adverse effect on nest sites that may be within the inundation area because existing trees already withstand floods in the area, the increase in inundation frequency and duration is expected to remain within the range of tolerance of riparian trees, and any nest sites would be located above floodwaters.

Based on hypothetical floodplain restoration, CM5 implementation could result in periodic inundation of up to approximately 229 acres of modeled white-tailed kite nesting habitat and 7,423 acres of modeled white-tailed kite foraging habitat (Table 12-4-40). Inundation of foraging habitat could result in a periodic reduction of available foraging habitat due to the reduction in available prey. Following draw-down, inundated habitats are expected to recover and provide suitable foraging conditions until the following inundation period. Thus, this is considered a periodic impact that is unlikely to affect white-tailed kite distribution and abundance, or foraging use of the Plan Area.

Periodic inundation of floodplains (through CM2 and CM5) would be expected to restore a more natural flood regime in support of riparian vegetation types that support white-tailed kite nesting habitat. No adverse effects of inundation on white-tailed kite riparian habitat are expected because valley/foothill riparian vegetation is expected to benefit from seasonal inundation.

CEQA Conclusion: Although foraging habitat would be periodically unavailable to white-tailed kite because of CM2 and CM5 implementation, inundated habitats are expected to recover following draw-down. Any effects are considered short-term and would not have a significant impact.

Yellow-Breasted Chat

Yellow-breasted chat modeled habitat includes suitable nesting and migratory habitat as those plant alliances from the valley/foothill riparian modeled habitat that contain a shrub component and an overstory component. Primary nesting and migratory habitat is qualitatively distinguished from secondary habitat in Delta areas as those plant associations that support a greater percentage of a suitable shrub cover, particularly blackberry, and California wild rose, and have an open to moderately dense overstory canopy, using data from Hickson and Keeler-Wolf (2007). No distinction is made between primary and secondary habitat for Suisun Marsh/Yolo Basin habitats because supporting information is lacking.

Construction and restoration associated with Alternative 4 conservation measures would result in both temporary and permanent losses of yellow-breasted chat modeled habitat as indicated in Table 12-4-41. Full implementation of Alternative 4 would restore or create 5,000 acres, and protect 750 acres of riparian habitat (Table 12-4-41). At least 1,000 of these acres would be managed as early- to mid-successional vegetation with a dense understory which would provide suitable habitat characteristics for yellow-breasted chat. As explained below, with the restoration or protection of these amounts of habitat, impacts on yellow-breasted chat would not be adverse for NEPA purposes and would be less than significant for CEQA purposes.

Table 12-4-41. Changes in Yellow-Breasted Chat Modeled Habitat Associated with Alternative 4 (acres)[a]

	Conservation Measure[b]	Habitat Type	Permanent		Temporary		Periodic[d]	
			NT	LLT	NT	LLT	Yolo	Floodplain
Habitat Affected[c]	CM1	Primary	17	17	5	NA	NA	NA
		Secondary	11	11	12	NA	NA	NA
		Suisun Marsh/ Upper Yolo Bypass	0	0	0	NA	NA	NA
	Total Impacts CM1		**28**	**28**	**17**			
	CM2–CM18	Primary	103	221	69	84	15–37	91
		Secondary	209	357	0	6	5–15	56
		Suisun Marsh/ Upper Yolo Bypass	203	212	67	67	22–31	0
	Total Impacts CM2–CM18		**515**	**790**	**136**	**157**	**45–82**	**147**
	TOTAL IMPACTS		**543**	**818**	**153**	**174**	**45–82**	**147**
Habitat Restored/ Created[e]	CM7 riparian restoration		800	5,000	NA	NA	NA	NA
	Total Restoration/Creation		**800**	**5,000**				
Habitat	CM3 riparian protection		750	750	NA	NA	NA	NA

Protected[e]			
	Total Protection	**750**	**750**

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late long-term timeframes.

[b] See discussion below for a description of applicable CMs.

[c] LLT acreages are a summation of effects that would occur in the near-term, early long-term and late long-term timeframes. The LLT acreages represent the total amount of habitat that would be affected over the 50-year life of the BDCP and do not reflect habitat increases that would result from restoration, creation and protection activities.

[d] Periodic effects were estimated for the late long-term only. Yolo periodic impacts are presented as a range based on different flow regimes at the proposed notch in Fremont Weir.

[e] Restored/created and protected habitat acreages represent planned conservation activities that would be implemented over the lifetime of the BDCP (see BDCP Chapter 3, *Conservation Strategy*, for specifics).

NT = near-term

LLT = late long-term

NA = not applicable

Impact BIO-104: Loss or conversion of habitat for and direct mortality of yellow-breasted chat

Alternative 4 conservation measures would result in the combined permanent and temporary loss of up to 992 acres of modeled habitat for yellow-breasted chat (Table 12-4-41). Conservation measures that would result in these losses are conveyance facilities and transmission line construction, and establishment and use of borrow and spoil areas (CM1), Fremont Weir/Yolo Bypass improvements (CM2), tidal habitat restoration (CM4), and floodplain restoration (CM5). Habitat enhancement and management activities (CM11) which include ground disturbance or removal of nonnative vegetation, could result in local adverse habitat effects. In addition, maintenance activities associated with the long-term operation of the water conveyance facilities and other BDCP physical facilities could degrade or eliminate yellow-breasted chat habitat. Each of these individual activities is described below. A summary statement of the combined impacts and NEPA and CEQA conclusions follows the individual conservation measure discussions.

- *CM1 Water Facilities and Operation:* Construction of Alternative 4 conveyance facilities would result in the combined permanent and temporary loss of up to 45 acres of modeled yellow-breasted chat habitat (28 acres of permanent, 17 acres of temporary) from CZs 3-6 and CZ 8 (Table 12-4-41). This loss would have the potential to displace individuals, if present, and remove the functions and value of modeled habitat for resting, protection, or foraging. Refer to the Terrestrial Biology Map Book for a detailed view of Alternative 4 construction locations.

  There would be a 6 acre increase in the combined permanent and temporary loss of yellow-breasted chat habitat associated with the construction of the east-west transmission line for the Alternative 4 water conveyance facilities rather than the north-south transmission line.

- *CM2 Yolo Bypass Fisheries Enhancement*: Construction of the Yolo bypass fisheries enhancement would permanently remove approximately 216 acres and temporarily remove 137 acres of modeled yellow-breasted chat habitat in the Yolo Bypass.

- *CM4 Tidal Natural Communities Restoration*: Tidal habitat restoration site preparation and inundation would permanently remove an estimated 545 acres of modeled yellow-breasted chat habitat in CZ 1, 2, 6, and 11. This total is composed of an estimated 182 acres of primary nesting and migratory habitat, 349 acres of secondary nesting and migratory habitat, and 14 acres of nesting and migratory habitat in the Suisun Marsh and upper Yolo Bypass areas. Valley/foothill riparian habitat would be restored within the transitional upland component of the 65,000 acres of restored tidal habitat, some of which would be suitable for yellow-breasted chat.

- *CM5 Seasonally Inundated Floodplain Restoration*: Construction of setback levees to restore seasonally inundated floodplain would permanently and temporarily remove approximately 49 acres of modeled yellow-breasted chat habitat in CZ 7. This total is comprised of 38 acres of primary nesting and migratory habitat and 11 acres of secondary nesting and migratory habitat. Based on the riparian habitat restoration assumptions, approximately 3,000 acres of valley/foothill riparian habitat would be restored as a component of seasonally inundated floodplain restoration actions. The actual number of acres that would be restored may differ from these estimates, depending on how closely the outcome of seasonally inundated floodplain restoration approximates the assumed outcome. Once this restored riparian vegetation has developed habitat functions, a portion of it would be suitable to support yellow-breasted chat habitat.
- *CM6 Channel Margin Enhancement*: There are no expected permanent direct adverse effects on yellow-breasted chat associated with channel margin enhancement. However, approximately 37 acres of valley/foothill riparian habitat that could support habitat for the yellow-breasted chat is expected to be restored as a component of channel margin enhancement actions along 20 miles of river and slough channels in the Delta. If an additional 20 miles of channel margin were enhanced under adaptive management, then another 37 acres of riparian would be restored.
- *CM10 Nontidal Marsh Restoration*: There are no expected adverse effects on yellow-breasted chat habitat associated with CM10. However, small patches of riparian vegetation that support chat habitat may develop along the margins of restored nontidal marsh if appropriate site conditions are present.
- *CM11 Natural Communities Enhancement and Management:* Habitat protection and management activities that could be implemented in protected yellow-breasted chat habitats would be expected to maintain and improve the functions of the habitat over the term of the BDCP. Yellow-breasted chat would be expected to benefit from the increase in protected habitat, which would maintain conditions favorable for the chat's use of the Plan Area.

  Habitat management- and enhancement-related activities could disturb yellow-breasted chat nests if they are present near work sites. Equipment operation could destroy nests, and noise and visual disturbances could lead to their abandonment, resulting in mortality of eggs and nestlings. *AMM23 Suisun Song Sparrow, Yellow-Breasted Chat, Least Bell's Vireo, Western Yellow-Billed Cuckoo* would ensure that these activities do not result in direct mortality of yellow-breasted chat or other adverse effects.

  Occupied habitat would be monitored to determine if there is a need to implement controls on brood parasites (brown-headed cowbird) or nest predators. If implemented, these actions would be expected to benefit the yellow-breasted chat by removing a potential stressor that could, if not addressed, adversely affect the stability of newly established populations.

  A variety of habitat management actions included in *CM11 Natural Communities Enhancement and Management* that are designed to enhance wildlife values in restored riparian habitats may result in localized ground disturbances that could temporarily remove small amounts of yellow-breasted chat habitat. Ground-disturbing activities, such as removal of nonnative vegetation and road and other infrastructure maintenance activities, are expected to have minor adverse effects on available yellow-breasted chat habitat and are expected to result in overall improvements to and maintenance of yellow-breasted chat habitat values over the term of the BDCP.

- Operations and Maintenance: Postconstruction operation and maintenance of the above-ground water conveyance facilities and restoration infrastructure could result in ongoing but periodic disturbances that could affect least Bell's vireo and yellow warbler use of the surrounding habitat. Maintenance activities would include vegetation management, levee and structure repair, and re-grading of roads and permanent work areas. These effects, however, would be reduced by AMMs and conservation actions as described below.
- Injury and Direct Mortality: Construction is not expected to result in direct mortality of yellow-breasted chat because adults and fledged young are expected to occur only in very small numbers and, if present, would avoid contact with construction and other equipment. If yellow-breasted chat were to nest in the vicinity of construction activities, equipment operation could destroy nests and noise and visual disturbances could lead to nest abandonment. *AMM23 Suisun Song Sparrow, Yellow-Breasted Chat, Least Bell's Vireo, Western Yellow-Billed Cuckoo* would avoid and minimize this effect.
- Permanent and temporary habitat losses from the above CMs, would primarily consist of small, fragmented riparian stands in CZ 2–CZ 8 that do not provide high-value habitat for the species. Temporarily affected areas would be restored as riparian habitat within 1 year following completion of construction activities. Although the effects are considered temporary, the restored riparian habitat would require 5 years to several decades, for ecological succession to occur and for restored riparian habitat to functionally replace habitat that has been affected. The majority of the riparian vegetation to be temporarily removed is early- to mid-successional; therefore, the replaced riparian vegetation would be expected to have structural components comparable to the temporarily removed vegetation within the first 5 to 10 years after the initial restoration activities are complete.

The following paragraphs summarize the combined effects discussed above and describe other BDCP conservation actions that offset or avoid these effects. NEPA and CEQA impact conclusions are also included.

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection and/or restoration in an appropriate timeframe to ensure that the effects of construction would not be adverse under NEPA and would be less than significant under CEQA. The Plan would remove 696 acres of modeled habitat for yellow-breasted chat in the study area in the near-term. These effects would result from the construction of the water conveyance facilities (CM1, 45 acres of modeled breeding and migratory habitat), and implementing other conservation measures (*CM2 Yolo Bypass Fisheries Enhancement*, *CM4 Tidal Natural Communities Restoration*, and *CM5 Seasonally Inundated Floodplain Restoration*—651 acres of modeled breeding and migratory habitat). These habitat losses would primarily consist of small, fragmented riparian stands in CZ 2-CZ 8 that do not provide high-value habitat for the species.

Typical NEPA and CEQA project-level mitigation ratios for those natural communities affected by CM1 and that are identified in the biological goals and objectives for yellow-breasted chat in Chapter

3 of the BDCP would be 1:1 for restoration/creation and 1:1 protection of valley/foothill riparian habitat. Using these typical ratios would indicate that 45 acres of valley/foothill riparian habitat should be restored/created and 45 acres should be protected to mitigate for the CM1 losses of yellow-breasted chat. The offsetting acreage would need to be 51 acres each of restoration and protection if the east-west transmission line alignment was selected for Alternative 4. Yellow-breasted chat have been recorded at the preserve and it would be highly desirable to reroute the eastern end of this alignment to avoid crossing the riparian reserve along the Cosumnes River, as it provides valuable riparian habitat. See Mitigation Measure BIO-9, *Avoid bisecting riparian corridor with east-west transmission line*, regarding this transmission line reroute. The near-term effects of other conservation actions would remove 651 acres of modeled habitat, and therefore require 651 acres of restoration and 651 acres of protection of valley/foothill riparian using the same typical NEPA and CEQA ratios (1:1 for restoration and 1:1 for protection).

The BDCP has committed to near-term goals of protecting 750 acres and restoring 800 acres of the valley/foothill riparian natural community in the study area. To ensure that this natural community conservation benefits yellow-breasted chat, the Plan's biological goals and objectives (BDCP, Chapter 3) further specify that the structural diversity of riparian habitat would be increased through *CM7 Riparian Natural Community Restoration* and *CM11 Natural Communities Enhancement and Management*. At least 1,000 acres of valley/foothill riparian natural community would be maintained by the late long-term as early- to mid-successional vegetation with a dense shrubby understory in seasonally inundated floodplain. Fluvial disturbance in restored riparian floodplains would help to maintain this early- to mid-successional vegetation. The resulting riparian systems would be subject to natural erosion and deposition, which would provide conditions conducive to the establishment of dense willow stands that are preferred by yellow-breasted chat for nesting. These natural community biological goals and objectives would inform the near-term protection and restoration efforts and represent performance standards for considering the effectiveness of restoration actions for the species.

The acres of protection contained in the near-term Plan are sufficient satisfy the typical mitigation ratios that would be applied to the project-level effects of CM1 and the other near-term impacts. However, the restored riparian habitat would require 5 years to several decades, for ecological succession to occur and for restored riparian habitat to functionally replace habitat that has been affected. Because the nesting and migratory habitat that would be lost is small relative to the species range throughout California and North America, BDCP actions would not be expected to have an adverse population-level effect on the species. Overall, BDCP riparian habitat restoration actions through CM3, CM7, and CM11 would be expected to benefit yellow-breasted chat by improving habitat conditions by increasing structural heterogeneity of riparian forest, increasing the size and connectivity of riparian forest in CZ 7, thereby increasing the likelihood of yellow-breasted chat nesting in the study area. In addition, if monitoring determined that cowbird parasitism was having an effect on the yellow-breasted population in the Plan Area, a cowbird control program would be implemented through CM11.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training*, *AMM2 Construction Best Management Practices and Monitoring, AMM3 Stormwater Pollution Prevention Plan*, *AMM4 Erosion and Sediment Control Plan*, *AMM5 Spill Prevention, Containment, and Countermeasure Plan*, *AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan*, *AMM7 Barge Operations Plan*, and *AMM23 Suisun Song Sparrow, Yellow-Breasted Chat, Least Bell's Vireo, Western Yellow-Billed Cuckoo*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas and disposal sites. The AMMs are described in detail in BDCP Appendix 3.C.

Late Long-Term Timeframe

The study area supports approximately 14,933 acres of modeled breeding and migratory habitat for yellow-breasted chat. Alternative 4 as a whole would result in the permanent loss of and temporary effects on 992 acres of modeled habitat (7% of the modeled habitat in the Plan Area). The locations of these losses would be in relatively small fragmented riparian habitat in CZs 1–8. The Plan includes a commitment to restore or create at least 5,000 acres in CZ 4 and/or CZ 7 and to protect at least 750 acres of valley/foothill riparian woodland in CZ 7. (Table 12-4-41). A minimum of 1,000 acres of early- to mid-successional riparian forest would be managed through portions of the 5,000 acres of restored and 750 acres of protected riparian natural community providing nesting habitat for the species.

The loss of western yellow-breasted chat habitat associated with Alternative 4 would represent an adverse effect as a result of habitat modification of a special-status species and potential for direct mortality in the absence of other conservation actions. The habitat lost would consist of small, fragmented riparian stands that would not provide high-value habitat for the species. The restored riparian habitat would require 5 years to several decades, for ecological succession to occur and for restored riparian habitat to functionally replace habitat that has been affected. Because the nesting and migratory habitat that would be lost is small relative to the species range throughout California and North America, BDCP actions would not be expected to have an adverse population-level effect on the species. Overall, BDCP riparian habitat restoration actions through CM3, CM7, and CM11 would be expected to benefit yellow-breasted chat by improving habitat conditions by increasing structural heterogeneity of riparian forest, increasing the size and connectivity of riparian forest in CZ 7, thereby increasing the likelihood of yellow-breasted chat nesting in the study area. In addition, if monitoring determined that cowbird parasitism was having an effect on the yellow-breasted population in the Plan Area, a cowbird control program would be implemented through CM11. With habitat protection and restoration associated with CM3, CM7, and CM11, guided by biological goals and objectives and AMM1–AMM7 and AMM23, which would be in place throughout the time period any construction activity would be occurring, the effects of habitat loss and potential mortality under Alternative 4 on yellow-breasted chat would not be adverse under NEPA.

CEQA Conclusion: Alternative 4 (CM1–CM5, and CM11) would have both temporary and permanent impacts on western yellow-breasted chat and their modeled habitat and operation of construction equipment could kill, injure, or disturb individuals, if present in the study area.

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the impacts of construction would be less than significant. The Plan would remove 696 acres of modeled habitat for yellow-breasted chat in the study area in the near-term. These effects would result from the construction of the water conveyance facilities (CM1, 40 acres of modeled breeding and migratory habitat), and implementing other conservation measures (Yolo Bypass Fisheries Enhancement [CM2] tidal restoration [CM4], Seasonally Inundated Floodplain Restoration [CM5], 651 acres of modeled breeding and migratory habitat). These habitat losses would primarily consist of small, fragmented riparian stands in CZ 2–CZ 8 that do not provide high-value habitat for the species.

Typical NEPA and CEQA project-level mitigation ratios for those natural communities affected by CM1 and that are identified in the biological goals and objectives for yellow-breasted chat in Chapter 3 of the BDCP would be 1:1 for restoration/creation and 1:1 protection of valley/foothill riparian habitat. Using these typical ratios would indicate that 40 acres of valley/foothill riparian habitat should be restored/created and 40 acres should be protected to mitigate for the CM1 losses of yellow-breasted chat. The offsetting acreage would need to be 51 acres each of restoration and protection if the east-west transmission line alignment was selected for Alternative 4. Yellow-breasted chat have been recorded at the preserve and it would be highly desirable to reroute the eastern end of this alignment to avoid crossing the riparian reserve along the Cosumnes River, as it provides valuable riparian habitat. See Mitigation Measure BIO-9, *Avoid bisecting riparian corridor with east-west transmission line,* regarding this transmission line reroute. The near-term effects of other conservation actions would remove 651 acres of modeled habitat, and therefore require 651 acres of restoration and 651 acres of protection of valley/foothill riparian using the same typical NEPA and CEQA ratios (1:1 for restoration and 1:1 for protection).

The BDCP has committed to near-term goals of protecting 750 acres and restoring 800 acres of the valley/foothill riparian natural community in the study area. To ensure that this natural community conservation benefits yellow-breasted chat, the Plan's biological goals and objectives (BDCP Chapter 3) further specify that the structural diversity of riparian habitat would be increased through *CM7 Riparian Natural Community Restoration* and *CM11 Natural Communities Enhancement and Management*. In addition, at least 1,000 acres of early- to mid-successional vegetation with a well-developed understory of dense shrubs would be maintained on restored seasonally inundated floodplain. Restoration actions through CM7 and CM11 would expand the patches of existing riparian forest in order to support the species. These biological goals and objectives would inform the near-term protection and restoration efforts and represent performance standards for considering the effectiveness of restoration actions.

The acres of protection contained in the near-term Plan goals are sufficient to meet the typical mitigation ratios that would be applied to the project-level effects of CM1 and other near-term impacts. However, the restored riparian habitat would require 5 years to several decades, for ecological succession to occur and for restored riparian habitat to functionally replace habitat that has been affected. Because the nesting and migratory habitat lost would be small relative to the species' range throughout California and North America, BDCP actions would not be expected to have a significant population-level impact on the species. Overall, BDCP riparian habitat restoration actions through CM3, CM7, and CM11 would be expected to benefit yellow-breasted chat by improving habitat conditions by increasing structural heterogeneity of riparian forest, increasing the size and connectivity of riparian forest in CZ 7, thereby increasing the likelihood of yellow-breasted chat nesting in the study area. In addition, if monitoring determined that cowbird parasitism was having an effect on the yellow-breasted population in the Plan Area, a cowbird control program would be implemented through CM11.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training*, *AMM2 Construction Best Management Practices and Monitoring, AMM3 Stormwater Pollution Prevention Plan*, *AMM4 Erosion and Sediment Control Plan*, *AMM5 Spill Prevention, Containment, and Countermeasure Plan*, *AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan*, *AMM7 Barge Operations Plan*, and *AMM23 Suisun Song Sparrow, Yellow-Breasted Chat, Least Bell's Vireo, Western Yellow-Billed Cuckoo*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas and disposal sites. The AMMs are described in detail in BDCP Appendix 3.C.

Late Long-Term Timeframe

The study area supports approximately 14,933 acres of modeled breeding and migratory habitat for yellow-breasted chat. Alternative 4 as a whole would result in the permanent loss of and temporary effects on 992 acres of modeled habitat (7% of the modeled habitat in the Plan Area). The locations of these losses would be in relatively small fragmented riparian habitat in CZs 1-8. The Plan includes a commitment to restore or create at least 5,000 acres in CZ 4 and/or CZ 7 and to protect at least 750 acres of valley/foothill riparian woodland in CZ 7. (Table 12-4-41). A minimum of 1,000 acres of early- to mid-successional riparian forest would be managed through portions of the 5,000 acres of restored and 750 acres of protected riparian natural community providing nesting habitat for the species. Therefore, there would be a time-lag before the restored habitat would benefit either species.

The habitat lost would consist of small, fragmented riparian stands that would not provide high-value habitat for the species. Habitat protection and restoration associated with CM3, CM7, and CM11, guided by biological goals and objectives and AMMs 1–7 and 23, which would be in place throughout the time period any construction activity would be occurring.

Considering these protection and restoration provisions, which would provide acreages of new or enhanced habitat in amounts suitable to compensate for habitats lost to construction and restoration activities, and implementation of AMM1–AMM7, and AMM23, the loss of habitat or direct mortality through implementation of Alternative 4 would not result in a substantial adverse effect through habitat modifications and would not substantially reduce the number or restrict the range of the species. Therefore, the loss of habitat or potential mortality under this alternative would have a less-than-significant impact on western yellow-breasted chat.

Impact BIO-105: Fragmentation of yellow-breasted chat habitat as a result of constructing the water conveyance facilities

Grading, filling, contouring, and other initial ground-disturbing activities for water conveyance facilities construction may temporarily fragment modeled yellow-breasted chat habitat. This could temporarily reduce the extent of and functions supported by the affected habitat. Because of the current infrequent occurrence and small numbers of yellow-breasted chat in the Plan Area, and because *CM5 Seasonally Inundated Floodplain Restoration* would restore and protect contiguous high-value riparian habitat in CZ 7, any such habitat fragmentation is expected to have no or minimal effect on the species.

CEQA Conclusion: Fragmentation of habitat would have a less-than-significant impact on yellow-breasted chat. The habitat functions for the species would be significantly improved through the implementation of CM5, which would restore and protect large contiguous patches of riparian habitat.

Impact BIO-106: Effects on yellow-breasted chat associated with electrical transmission facilities

New transmission lines would increase the risk for bird-power line strikes, which could result in injury or mortality of western yellow-billed cuckoo. Yellow-breasted chats are migratory and usually arrive at California breeding grounds in April from their wintering grounds in Mexico and Guatemala. Departure for wintering grounds occurs from August to September. These are periods of relative high visibility when the risk of powerline collisions will be low. The species' small, relatively maneuverable body; its foraging behavior; and its presence in the Plan Area during the summer contribute to a low risk of collision with the proposed transmission lines (BDCP Attachment 5.J-2, *Memorandum: Analysis of Potential Bird Collisions at Proposed BDCP Transmission Lines)*. New transmission lines would therefore not be expected to have an adverse effect on yellow-breasted chat.

CEQA Conclusion: The construction and presence of new transmission lines would have a less-than-significant impact on yellow-breasted chat because the risk of bird strike is considered to be minimal based on the species' small, relatively maneuverable body; its foraging behavior; and its presence in the Plan Area during the summer during periods of high visibility.

Impact BIO-107: Indirect effects of plan implementation on yellow-breasted chat

Noise and visual disturbances associated with construction-related activities could result in temporary disturbances that affect yellow-breasted chat use of an estimated 1,274 acres of modeled habitat adjacent to proposed construction areas. Indirect effects associated with construction include noise, dust, and visual disturbance caused by grading, filling, contouring, and other ground-disturbing operations outside the project footprint but within 1,300 feet from the construction edge. If yellow-breasted chat were to nest in or adjacent to work areas, construction and subsequent maintenance-related noise and visual disturbances could mask calls, disrupt foraging and nesting behaviors, and reduce the functions of suitable nesting habitat for these species. These potential adverse effects would be minimized with incorporation of *AMM23 Suisun Song Sparrow, Yellow-Breasted Chat, Least Bell's Vireo, Western Yellow-Billed Cuckoo* into the BDCP, which would ensure 250 foot no-disturbance buffers were established around active nests. The use of mechanical equipment during water conveyance facilities construction could cause the accidental release of petroleum or other contaminants that could affect yellow-breasted chat in the surrounding habitat. The inadvertent discharge of sediment or excessive dust adjacent to yellow-breasted chat habitat could also affect the species. AMM1–AMM7, including *AMM2 Construction Best Management Practices and Monitoring*, in addition to *AMM23 Suisun Song Sparrow, Yellow-Breasted Chat, Least Bell's Vireo, Western Yellow-Billed Cuckoo* would minimize the likelihood of such spills from occurring and ensure that measures were in place to prevent runoff from the construction area and any adverse effects of dust on active nests. If present, yellow-breasted chat individuals could be temporarily affected by noise and visual disturbances adjacent to water conveyance construction sites, reducing the use of an estimated 59 acres of modeled primary nesting and migratory habitat and 119 acres of secondary nesting and migratory habitat. *AMM23 Suisun Song Sparrow, Yellow-Breasted Chat, Least Bell's Vireo, Western Yellow-Billed Cuckoo* would avoid and minimize this effect on the species.

CEQA Conclusion: The potential for noise and visual disturbance, hazardous spills, increased dust and sedimentation, and the potential impacts of operations and maintenance of the water conveyance facilities would have a less-than-significant impact on yellow-breasted chat with the incorporation of AMM1–AMM7, and *AMM23 Suisun Song Sparrow, Yellow-Breasted Chat, Least Bell's Vireo, Western Yellow-Billed Cuckoo* into the BDCP.

Impact BIO-108: Periodic effects of inundation of yellow-breasted chat habitat as a result of implementation of conservation components

Flooding of the Yolo Bypass from Fremont Weir operations (CM2) would increase the frequency and duration of inundation of approximately 45–82 acres of modeled yellow-breasted chat nesting and migratory habitat. No adverse effects of increased inundation frequency on yellow-breasted chat or its habitat are expected because the chat breeding period is outside the period the weir would be operated. Moreover, riparian vegetation supporting habitat has persisted under the existing Yolo Bypass flooding regime, and changes to frequency and inundation would be within the tolerance of these vegetation types.

Based on hypothetical floodplain restoration, CM5 could result in periodic inundation of up to 147 acres of modeled yellow-breasted chat habitat. Inundation of restored floodplains is not expected to affect yellow-breasted chat or its habitat because the chat breeding period is outside the period the floodplains would likely be inundated. In addition, providing for periodic inundation of floodplains is expected to restore a more natural flood regime in support of riparian vegetation types that provide nesting and migratory habitat for yellow-breasted chat. The overall effect of seasonal inundation in existing riparian natural communities is likely to be beneficial because, historically, flooding was the main natural disturbance regulating ecological processes in riparian areas, and flooding promotes the germination and establishment of many native riparian plants.

CEQA Conclusion: By creating more natural flood regimes that would support riparian habitat, increases in the frequency and duration of Yolo Bypass flooding and CM5 floodplain restoration would have a beneficial impact on yellow breasted chat.

Cooper's Hawk and Osprey

This section describes the effects of Alternative 4, including water conveyance facilities construction and implementation of other conservation components, on Cooper's hawk and osprey. Although osprey often nest on manmade structures such as telephone poles, and Cooper's hawk will nest in more developed landscapes, modeled breeding habitat for these species is restricted to valley/foothill riparian forest.

Construction and restoration associated with Alternative 4 conservation measures would result in both temporary and permanent losses of Cooper's hawk and osprey modeled habitat as indicated in Table 12-4-42. Full implementation of Alternative 4 actions that are expected to affect Cooper's hawk and osprey, would restore or create 5,000 acres, and protect 750 acres of riparian habitat. In addition, temporarily affected riparian areas would be restored as riparian habitat within 1 year following completion of construction activities. Although restoration to offset the loss of riparian habitat would be initiated in the near-term, it would take 1 or more decades for restored habitats to replace the functions of habitat lost. This time lag between impacts and restoration of habitat function would be minimized through specific tree planting requirements of *AMM18 Swainson's Hawk and White-Tailed Kite*, including number of plantings, location, species of trees, and monitoring, associated with restoration success. Furthermore, restoration to offset impacts on nesting habitat within the first 10 years would be initiated within 18 months of Plan approval. As explained below, with the acres of restoration or protection included in the Plan, impacts on Cooper's hawk and osprey would not be adverse for NEPA purposes and would be less than significant for CEQA purposes.

Table 12-4-42. Changes in Cooper's Hawk and Osprey Modeled Habitat Associated with Alternative 4 (acres)[a]

	Conservation Measure[b]	Habitat Type	Permanent		Temporary		Periodic[d]	
			NT	LLT	NT	LLT	Yolo	Floodplain
Habitat	CM1	Breeding	23	NA	17	NA	NA	NA

Affected[c]								
	Total Impacts CM1		**23**		**17**			
	CM2–CM18	Breeding	444	640	134	167	45–79	229
	Total Impacts CM2–CM18		**444**	**640**	**134**	**167**	**45–79**	**229**
	TOTAL IMPACTS		**467**	**669**	**151**	**197**	**44–82**	**229**
Habitat Restored/ Created[e]	CM7 riparian restoration		800	5,000	NA	NA	NA	NA
	Total Restoration/Creation		**800**	**5,000**				
Habitat Protected[e]	CM3 riparian protection		750	NA	NA	NA	NA	NA
	Total Protection		**750**					

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late long-term timeframes.

[b] See discussion below for a description of applicable CMs.

[c] LLT acreages are a summation of effects that would occur in the near-term, early long-term and late long-term timeframes. The LLT acreages represent the total amount of habitat that would be affected over the 50-year life of the BDCP and do not reflect habitat increases that would result from restoration, creation and protection activities.

[d] Periodic effects were estimated for the late long-term only. Yolo periodic impacts are presented as a range based on different flow regimes at the proposed notch in Fremont Weir.

[e] Restored/created and protected habitat acreages represent planned conservation activities that would be implemented over the lifetime of the BDCP (see BDCP Chapter 3, *Conservation Strategy*, for specifics).

NT = near-term

LLT = late long-term

NA = not applicable

Impact BIO-109: Loss or conversion of habitat and direct mortality of Cooper's hawk and osprey

Alternative 4 conservation measures would result in the combined permanent and temporary loss of up to 866 acres of modeled habitat for Cooper's hawk and osprey (Table 12-4-42). Conservation measures that would result in these losses are Water Facilities and Operation (CM1) (which would involve construction of conveyance facilities and transmission lines and establishment and use of borrow and spoil areas), Yolo Bypass Fisheries Enhancement (CM2), Tidal Natural Communities Restoration (CM4), and Seasonally Inundated Floodplain Restoration (CM5). Habitat enhancement and management activities (CM11), which would include ground disturbance or removal of nonnative vegetation, could result in local adverse habitat effects. In addition, maintenance activities associated with the long-term operation of the water conveyance facilities and other BDCP physical facilities could affect Cooper's hawk and osprey modeled habitat. Each of these individual activities is described below. A summary statement of the combined impacts and NEPA and CEQA conclusions follows the individual conservation measure discussions.

- *CM1 Water Facilities and Operation:* Construction of Alternative 4 water conveyance facilities would result in the combined permanent and temporary loss of up to 40 acres of modeled Cooper's hawk and osprey habitat (Table 12-4-42). Of the 40 acres of modeled habitat that would be removed for the construction of the conveyance facilities, 23 acres would be a permanent loss and 17 acres would be a temporary loss of habitat. This loss would have the potential to displace individuals, if present, and remove the functions and value of potentially suitable habitat. Activities that would impact modeled habitat consist of tunnel, forebay, and intake construction, temporary access roads, and construction of transmission lines. Impacts from CM1 would occur in the central delta in CZ 3, CZ 4, CZ 5, CZ 6, and CZ 8. Refer to the Terrestrial Biology Map Book for a detailed view of Alternative 4 construction locations.

There would be an 8 acre increase in the combined permanent and temporary loss of Cooper's hawk and osprey modeled breeding habitat associated with the construction of the east-west transmission line for the Alternative 4 water conveyance facilities rather than the north-south transmission line.

- *CM2 Yolo Bypass Fisheries Enhancement:* Construction of the Yolo bypass fisheries enhancement—specifically, construction of conveyance channels extending from the Sacramento River to the weir and from the weir into the Yolo Bypass—would permanently remove approximately 214 acres of suitable Cooper's hawk and osprey nesting habitat. In addition, levee reinforcement activities would temporarily remove 134 acres of nesting habitat.
- *CM4 Tidal Natural Communities Restoration:* Tidal habitat restoration could permanently remove up to 384 acres of potential Cooper's hawk and osprey nesting habitat.
- *CM5 Seasonally Inundated Floodplain Restoration:* Construction of setback levees to restore seasonally inundated floodplain (CM5) would permanently remove approximately 42 acres and temporarily remove approximately 33 acres of potential Cooper's hawk and osprey nesting habitat.
- *CM6 Channel Margin Enhancement:* Approximately 37 acres of valley/foothill riparian habitat are expected to be restored as a component of channel margin enhancement actions along 20 miles of river and slough channels in the Delta. Another 37 acres of riparian habitat would be restored if 20 more miles of channel margin were enhanced under adaptive management. Some of the restored riparian habitat in the channel margin is expected to support nesting habitat for raptors.
- *CM11 Natural Communities Enhancement and Management:* Habitat management- and enhancement-related activities could disturb Cooper's hawk and osprey nests if they were present near work sites. A variety of habitat management actions included in *CM11 Natural Communities Enhancement and Management* that are designed to enhance wildlife values in BDCP-protected habitats may result in localized ground disturbances that could temporarily remove small amounts of Cooper's hawk and osprey habitat and reduce the functions of habitat until restoration is complete. Ground-disturbing activities, such as removal of nonnative vegetation and road and other infrastructure maintenance, are expected to have minor effects on available Cooper's hawk and osprey habitat and are expected to result in overall improvements to and maintenance of habitat values over the term of the BDCP. These effects cannot be quantified, but are expected to be minimal and would be avoided and minimized by the AMMs listed below.
- Permanent and temporary habitat losses from the above conservation measures would primarily consist of fragmented riparian stands in CZs 2, 3, 4, 5, 6, 7, and 8. Temporarily affected areas would be restored as riparian habitat within 1 year following completion of construction activities. Although the effects are considered temporary, the restored riparian habitat would require 1 to several decades to functionally replace habitat that has been affected and for trees to attain sufficient size and structure suitable for nesting by Cooper's hawk or osprey. The restored riparian habitats would be designed to provide future nesting habitat in large

contiguous patches over the term of the BDCP in order to increase nesting opportunities for the species.

- Operations and Maintenance: Postconstruction operation and maintenance of the above-ground water conveyance facilities and restoration infrastructure could result in ongoing but periodic disturbances that could affect Cooper's hawk or osprey use of the surrounding habitat. Maintenance activities would include vegetation management, levee and structure repair, and re-grading of roads and permanent work areas. These effects, however, would be reduced by AMMs and conservation actions as described below.
- Injury and Direct Mortality: Construction-related activities would not be expected to result in direct mortality of adult or fledged Cooper's hawk or osprey if they were present in the Plan Area, because they would be expected to avoid contact with construction and other equipment. If Cooper's hawk or osprey were to nest in the construction area, construction-related activities, including equipment operation, noise and visual disturbances could affect nests or lead to their abandonment, potentially resulting in mortality of eggs and nestlings. Mitigation Measure BIO-75, *Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds*, would be available to address these potential adverse effects on Cooper's hawk and osprey.

The following paragraphs summarize the combined effects discussed above and describe other BDCP conservation actions that offset or avoid these effects. NEPA and CEQA impact conclusions are also included.

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the effect of construction would not be adverse under NEPA. The Plan would remove 618 acres of breeding habitat for Cooper's hawk and osprey in the study area in the near-term. These effects would result from the construction of the water conveyance facilities (CM1, 40 acres), and implementing other conservation measures (*CM2 Yolo Bypass Fisheries Enhancement*, *CM4 Tidal Natural Communities Restoration*, and *CM5 Seasonally Inundated Floodplain Restoration*—578 acres of habitat).

Typical NEPA and CEQA project-level mitigation ratios for those natural communities affected by CM1 would be 1:1 for restoration/creation and 1:1 protection of valley/foothill riparian habitat for breeding habitat. Using these typical ratios would indicate that 40 acres of breeding habitat should be restored/created and 40 acres should be protected to mitigate for the CM1 losses of modeled Cooper's hawk and osprey habitat. The offsetting acreage would need to be 48 acres each of restoration and protection if the east-west transmission line alignment was selected for Alternative 4. In addition, The near-term effects of other conservation actions would remove 578 acres of modeled breeding habitat, and therefore require 578 acres of restoration and 578 acres of protection of modeled Cooper's hawk and osprey using the same typical NEPA and CEQA ratios.

The BDCP has committed to near-term goals of protecting 750 acres and restoring 800 acres of the valley/foothill riparian natural community. Temporarily disturbed nesting habitat would be restored following the completion of construction. Riparian restoration actions through CM7 and CM11 would expand the patches of existing riparian forest in order to improve nesting habitat for riparian species in the Plan Area. The Plan's species-specific biological goals and objectives (BDCP Chapter 3, *Conservation Strategy*) for Swainson's hawk and white-tailed kite would also benefit

Cooper's hawk and osprey by protecting small but essential habitats that occur within cultivated lands, such as tree rows along field borders or roads, and small clusters of trees in farmyards or rural residences.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training*, *AMM2 Construction Best Management Practices and Monitoring, AMM3 Stormwater Pollution Prevention Plan*, *AMM4 Erosion and Sediment Control Plan*, *AMM5 Spill Prevention, Containment, and Countermeasure Plan*, *AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan*, *AMM7 Barge Operations Plan*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas and disposal sites. The AMMs are described in detail in BDCP Appendix 3.C. Cooper's hawk and osprey are not species that are covered under the BDCP. In order to have a less than adverse effect on individuals, preconstruction surveys for noncovered avian species would be required to ensure that active nests are detected and avoided. Mitigation Measure BIO-75, *Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds*, would be available to address this potential adverse effect.

The near-term loss of 618 acres of nesting habitat would not have an adverse effect on either Cooper's hawk or osprey because the impacted habitat is primarily lower value habitat, and these species would persist in other nesting habitat available within the study area until restored nesting habitat becomes functional. In addition, approximately 230 acres of the nesting habitat would be impacted as a result of *CM4 Tidal Natural Communities Restoration*. Trees would not be actively removed but tree mortality would be expected over time as areas became tidally inundated. Restoration projects under CM4 would be prioritized in areas where tidal habitat restoration would not adversely affect mature riparian stands in the near-term time period.

The acres of protection contained in the near-term Plan goals satisfy the typical mitigation ratios that would be applied to the project-level effects of CM1 on nesting habitat for Cooper's hawk and osprey. The 800 acres of riparian restoration would be initiated in the near-term to offset the loss of 618 acres of modeled nesting habitat. However, it would take 1 to several decades for restored habitat to functionally replace habitat that has been affected and for the trees to attain sufficient size and structure suitable for nesting. This time lag between the removal and restoration of nesting habitat could have a substantial impact on Cooper's hawk and osprey in the near-term time period. *AMM18 Swainson's Hawk and White-Tailed Kite* requires that three 5-gallon trees be planted for each potential nest tree (i.e., trees that are large enough to provide potential habitat for Swainson's hawk and white-tailed kite, and which would also provide nesting habitat for Cooper's hawk and osprey) expected to be removed during the near-term period. Trees would be planted in clumps of at least three on cultivated lands as part of CM11 or would be incorporated into riparian restoration under CM7. To further offset near-term impacts, under AMM18, a variety of native tree species with differing growth rates would be planted. This variety would ensure that nesting habitat is available quickly (approximately 10 years for cottonwoods and willows) and in the longer term (valley oaks, black walnuts, and sycamores). Nesting tree replacement planting would occur within 18 months of Plan approval and a monitoring and maintenance plan described in CM11 would ensure the establishment and survival of planted trees. For all of these reasons, Alternative 4 would not have a substantial adverse effect on Cooper's hawk or osprey in the near-term timeframe, either through direct mortality or through habitat modifications.

Late Long-Term Timeframe

The study area supports approximately 14,515 acres of modeled breeding habitat for Cooper's hawk and osprey. Alternative 4 as a whole would result in the permanent loss of and temporary effects on 866 acres of potential breeding habitat (6% of the potential breeding habitat in the study area). The Plan includes a commitment to restore or create at least 5,000 acres of valley/foothill riparian woodland in CZ 4 and/or CZ 7 and protect at least 750 acres of valley/foothill riparian woodland in CZ 7. Riparian restoration actions through CM7 and CM11 would expand the patches of existing riparian forest in order to improve nesting habitat for Cooper's hawk and osprey in the Plan Area. The Plan's species-specific biological goals and objectives (BDCP Chapter 3, *Conservation Strategy*) for Swainson's hawk and white-tailed kite would also benefit Cooper's hawk and osprey by protecting small but essential habitats that occur within cultivated lands, such as tree rows along field borders or roads, and small clusters of trees in farmyards or rural residences.

The loss of Cooper's hawk and osprey habitat associated with Alternative 4 would represent an adverse effect as a result of habitat modification of a special-status species and potential for direct mortality in the absence of other conservation actions. Cooper's hawk and osprey are not covered species under the BDCP and in order to have a less than adverse effect on individuals, preconstruction surveys for noncovered avian species would be required to ensure that nests are detected and avoided. Mitigation Measure BIO-75 would be available to address this potential adverse effect. With habitat protection and restoration associated with CM3, CM5, CM7, CM8, CM9, and CM11, guided by biological goals and objectives and AMM1–AMM7 and AMM18, which would be in place throughout the time period any construction activity would be occurring, the effects of habitat loss and potential mortality under Alternative 4 on Cooper's hawk and osprey would not be adverse under NEPA.

CEQA Conclusion: Alternative 4 (CM1–CM18) would have both temporary and permanent impacts on Cooper's hawk and osprey and their modeled habitat and operation of construction equipment could kill, injure, or disturb individuals, if present in the study area.

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the impacts of construction would be less than significant under CEQA. The Plan would remove 618 acres of breeding habitat for Cooper's hawk and osprey in the study area in the near-term. These effects would result from the construction of the water conveyance facilities (CM1, 40 acres), and implementing other conservation measures (*CM2 Yolo Bypass Fisheries Enhancement*, *CM4 Tidal Natural Communities Restoration*, and *CM5 Seasonally Inundated Floodplain Restoration*—578 acres of habitat).

Typical NEPA and CEQA project-level mitigation ratios for those natural communities affected by CM1 would be 1:1 for restoration/creation and 1:1 protection of valley/foothill riparian habitat for breeding habitat. Using these typical ratios would indicate that 40 acres of breeding habitat should be restored/created and 40 acres should be protected to mitigate for the CM1 losses of modeled Cooper's hawk and osprey habitat. The offsetting acreage would need to be 48 acres each of restoration and protection if the east-west transmission line alignment was selected for Alternative 4. In addition, The near-term effects of other conservation actions would remove 578 acres of modeled breeding habitat, and therefore require 578 acres of restoration and 578 acres of protection of modeled Cooper's hawk and osprey using the same typical NEPA and CEQA ratios.

The BDCP has committed to near-term goals of protecting 750 acres and restoring 800 acres of the valley/foothill riparian natural community. Temporarily disturbed habitat would be restored following the completion of construction. Riparian restoration actions through CM7 and CM11 would expand the patches of existing riparian forest in order to improve nesting habitat for riparian species in the Plan Area. The Plan's species-specific biological goals and objectives (BDCP Chapter 3, *Conservation Strategy*) for Swainson's hawk and white-tailed kite would also benefit Cooper's hawk and osprey by protecting small but essential habitats that occur within cultivated lands, such as tree rows along field borders or roads, and small clusters of trees in farmyards or rural residences.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training*, *AMM2 Construction Best Management Practices and Monitoring, AMM3 Stormwater Pollution Prevention Plan*, *AMM4 Erosion and Sediment Control Plan*, *AMM5 Spill Prevention, Containment, and Countermeasure Plan*, *AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan*, *AMM7 Barge Operations Plan*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas and disposal sites. The AMMs are described in detail in BDCP Appendix 3.C. Cooper's hawk and osprey are not species that are covered under the BDCP. In order to have a less than adverse effect on individuals, preconstruction surveys for noncovered avian species would be required to ensure that yellow warbler nests are detected and avoided. The implementation of Mitigation Measure BIO-75, *Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds*, would reduce potential adverse effects on nesting Cooper's hawk and osprey to a less-than-significant level.

The near-term loss of 618 acres of nesting habitat would not have a significant impact on either Cooper's hawk or osprey because the impacted habitat is primarily lower value habitat and these species would persist in other nesting habitat available within the study area until restored nesting habitat becomes functional. In addition, approximately 230 acres of this nesting habitat would be impacted as a result of *CM4 Tidal Natural Communities Restoration*. Trees would not be actively removed but tree mortality would be expected over time as areas became tidally inundated. Restoration projects under CM4 would be prioritized in areas where tidal habitat restoration would not substantially affect mature riparian stands in the near-term time period.

The acres of protection contained in the near-term Plan goals satisfy the typical mitigation ratios that would be applied to the project-level effects of CM1 on nesting habitat for Cooper's hawk and osprey. The 800 acres of riparian habitat restoration would be initiated in the near-term to offset the loss of 618 acres of modeled nesting habitat. However, it would take 1 to several decades for restored habitat to functionally replace habitat that has been affected and for the trees to attain sufficient size and structure suitable for nesting. This time lag between the removal and restoration of nesting habitat could have a substantial impact on Cooper's hawk and osprey in the near-term time period. *AMM18 Swainson's Hawk and White-Tailed Kite* includes the requirement that three 5-gallon trees be planted for each potential nest tree (i.e., trees that are large enough to provide potential habitat for Swainson's hawk and white-tailed kite, and which would also provide nesting habitat for Cooper's hawk and osprey) expected to be removed during the near-term period. Trees would be planted in clumps of at least three on cultivated lands as part of CM11 or would be incorporated into riparian restoration under CM7. To further offset near-term impacts, under AMM18, a variety of native tree species with differing growth rates would be planted. This variety would ensure that nesting habitat is available quickly (approximately 10 years for cottonwoods and willows) and in the longer term (valley oaks, black walnuts, and sycamores). Nesting tree replacement planting would occur within 18 months of Plan approval and a monitoring and maintenance plan described in CM11 would ensure the establishment and survival of planted trees.

For all of these reasons, Alternative 4 would not have a substantial adverse effect on Cooper's hawk or osprey in the near-term timeframe, either through direct mortality or through habitat modifications. The impact would be less than significant.

Late Long-Term Timeframe

The study area supports approximately 14,515 acres of modeled breeding habitat for Cooper's hawk and osprey. Alternative 4 as a whole would result in the permanent loss of and temporary effects on 866 acres of potential breeding habitat (6% of the potential breeding habitat in the study area). The Plan includes a commitment to restore or create at least 5,000 acres of valley/foothill riparian woodland in CZ 4 and/or CZ 7 and protect at least 750 acres of valley/foothill riparian woodland in CZ 7. Riparian restoration actions through CM7 and CM11 would expand the patches of existing riparian forest in order to improve nesting habitat for Cooper's hawk and osprey in the Plan Area. The Plan's species-specific biological goals and objectives (BDCP Chapter 3, *Conservation Strategy*) for Swainson's hawk and white-tailed kite would also benefit Cooper's hawk and osprey by protecting small but essential habitats that occur within cultivated lands, such as tree rows along field borders or roads, and small clusters of trees in farmyards or rural residences.

Considering these protection and restoration provisions, which would provide acreages of new or enhanced habitat in amounts greater than necessary to compensate for the time lag of restoring riparian habitats lost to construction and restoration activities, and implementation of AMM1–AMM7, and Mitigation Measure BIO-75, the loss of habitat or direct mortality through implementation of Alternative 4 would not result in a substantial adverse effect through habitat modifications and would not substantially reduce the number or restrict the range of either species. Therefore, the loss of habitat or potential mortality under this alternative would have a less-than-significant impact on Cooper's hawk and osprey.

Mitigation Measure BIO-75: Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds

See Mitigation Measure BIO-75 under Impact BIO-75.

Impact BIO-110: Effects on Cooper's hawk and osprey associated with electrical transmission facilities

New transmission lines would increase the risk for bird-power line strikes, which could result in injury or mortality of Cooper's hawk and osprey. The risk for bird-power line strikes, would be minimized with *AMM20 Greater Sandhill Crane*. This measure would ensure that conductor and ground lines are fitted with flight diverters in compliance with the best available practices, such as those specified in the USFWS Avian Protection Guidelines, and would result in a less than adverse effect on these species.

CEQA Conclusion: New transmission lines would increase the risk for bird-power line strikes, which could result in injury or mortality of Cooper's hawk and osprey. *AMM20 Greater Sandhill Crane* would minimize this risk would reduce the impact of new transmission lines on Cooper's hawk and osprey to a less-than-significant level.

Impact BIO-111: Indirect effects of plan implementation on Cooper's hawk and osprey

Indirect construction-related effects: If Cooper's hawk or osprey were to nest in or adjacent to work areas, construction and subsequent maintenance-related noise and visual disturbances could mask calls, disrupt foraging and nesting behaviors, and reduce the functions of suitable nesting habitat for these species. Mitigation Measure BIO-75, *Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds*, would avoid the potential for adverse effects of construction-related activities on survival and productivity of nesting Cooper's hawk and osprey. The use of mechanical equipment during water conveyance facilities construction could cause the accidental release of petroleum or other contaminants that could affect Cooper's hawk and osprey in the surrounding habitat. The inadvertent discharge of sediment or excessive dust adjacent to suitable habitat could also have an adverse effect on these species. AMM1–AMM7, including *AMM2 Construction Best Management Practices and Monitoring*, would minimize the likelihood of such spills and ensure that measures are in place to prevent runoff from the construction area and negative effects of dust on active nests.

Methylmercury Exposure: Covered activities have the potential to exacerbate bioaccumulation of mercury in avian species, including Cooper's hawk and osprey. Future operational impacts under CM1 were analyzed using a DSM-2 based model to assess potential effects on mercury concentration and bioavailability resulting from proposed flows. Subsequently, a regression model was used to estimate fish-tissue concentrations under these future operational conditions (evaluated starting operations or ESO). Results indicated that changes in total mercury levels in water and fish tissues due to ESO were insignificant (see BDCP Appendix 5.D, Tables 5D.4-3, 5D.4-4, and 5D.4-5).

Marsh (tidal and nontidal) and floodplain restoration have the potential to increase exposure to methylmercury. Mercury is transformed into the more bioavailable form of methylmercury in aquatic systems, especially areas subjected to regular wetting and drying such as tidal marshes and flood plains (Alpers et al. 2008). Thus, BDCP restoration activities that create newly inundated areas could increase bioavailability of mercury (see BDCP Chapter 3, *Conservation Strategy*, for details of restoration). Species sensitivity to methylmercury differs widely and there is a large amount of uncertainty with respect to species-specific effects. Increased methylmercury associated with natural community and floodplain restoration could indirectly affect cooper's hawk and osprey, via uptake in lower tropic levels (as described in the BDCP, Appendix 5.D, *Contaminants*).

In addition, the potential mobilization or creation of methylmercury within the Plan Area varies with site-specific conditions and would need to be assessed at the project level. Measures described in Chapter 3 of the BDCP, Section 3.4.13, *CM12 Methylmercury Management* include provisions for Project-specific Mercury Management Plans. Site-specific restoration plans that address the creation and mobilization of mercury, as well as monitoring and adaptive management as described in CM12 would be available to address the uncertainty of methylmercury levels in restored tidal marsh and potential impacts on cooper's hawk and osprey.

CEQA Conclusion: Impacts of noise, the potential for hazardous spills, increased dust and sedimentation, and operations and maintenance of the water conveyance facilities would be less than significant with the implementation of Mitigation Measure BIO-75, *Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds*, and AMM1–AMM7. The implementation of tidal natural communities restoration or floodplain restoration could result in increased exposure of Cooper's hawk or osprey to methylmercury, through the ingestion of fish or small mammals in tidally restored areas. However, it is currently unknown what concentrations of methylmercury are harmful to these species. Site-specific restoration plans that address the creation and mobilization of mercury, as well as monitoring and adaptive management as described in CM12 would better inform potential impacts and address the uncertainty of methylmercury levels in restored tidal marsh in the study area on cooper's hawk and osprey.

Mitigation Measure BIO-75: Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds

See Mitigation Measure BIO-75 under Impact BIO-75.

Impact BIO-112: Periodic effects of inundation of Cooper's hawk and osprey nesting habitat as a result of implementation of conservation components

Flooding of the Yolo Bypass from Fremont Weir operations (CM2) would increase the frequency and duration of inundation of approximately 39–67 acres of modeled Cooper's hawk and osprey breeding habitat However, increased periodic flooding is not expected to cause any adverse effect on breeding habitat because trees in which nest sites are situated already withstand floods, the increase in inundation frequency and duration is expected to remain within the range of tolerance of riparian trees, and nest sites are located above floodwaters.

Based on hypothetical floodplain restoration, CM5 implementation could result in periodic inundation of up to 188 acres of breeding habitat for Cooper's hawk and osprey. The overall effect of seasonal inundation in existing riparian natural communities is likely to be beneficial for these species, because, historically, flooding was the main natural disturbance regulating ecological processes in riparian areas, and flooding promotes the germination and establishment of many native riparian plants.

CEQA Conclusion: Increased periodic flooding would not be expected to cause any adverse effect on nest sites because trees in which nest sites are situated already withstand floods, the increase in inundation frequency and duration is expected to remain within the range of tolerance of riparian trees, and nest sites are located above floodwaters. Therefore, increased duration and inundation from CM2 and CM5 would have a less-than-significant impact on Cooper's hawk and osprey.

Golden Eagle and Ferruginous Hawk

This section describes the effects of Alternative 4, including water conveyance facilities construction and implementation of other conservation components, on golden eagle and ferruginous hawk. Modeled foraging habitat for these species consists of the grassland natural community throughout the Plan Area.

Construction and restoration associated with Alternative 4 conservation measures would result in both temporary and permanent losses of golden eagle and ferruginous hawk modeled foraging habitat as indicated in Table 12-4-43. Full implementation of Alternative 4 would restore or create 2,000 acres, and protect 8,000 acres of grassland habitat for these species (Table 12-4-43). As explained below, with the restoration or protection of these amounts of habitat, impacts on golden eagle and ferruginous hawk would not be adverse for NEPA purposes and would be less than significant for CEQA purposes.

Table 12-4-43. Changes in Golden Eagle and Ferruginous Hawk Habitat Associated with Alternative 4 (acres)[a]

	Conservation Measure[b]	Habitat Type	Permanent		Temporary		Periodic[d]	
			NT	LLT	NT	LLT	Yolo	Floodplain

Habitat CM1	Foraging	308	308		255 2 5 5		NA N A	
	Total Impacts CM1		**308**	**308**	**255**	**255**		
	CM2–CM18	Foraging	951	2,251	165	197	386–1,277	513
	Total Impacts CM2–CM18		**951**	**2,251**	**165**	**197**	**386–1,277**	**513**
	TOTAL IMPACTS		**1,259**	**2,559**	**420**	**452**	**386–1,277**	**513**
Habitat Restored/ Created[e]	CM8 grassland		1,140	2,000	NA	NA	NA	NA
	Total Restoration/Creation		**1,140**	**2,000**				
Habitat Protected[e]	CM3 grassland		2,000	8,000	NA	NA	NA	NA
	Total Protection		**2,000**	**8,000**				

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late long-term timeframes.

[b] See discussion below for a description of applicable CMs.

[c] LLT acreages are a summation of effects that would occur in the near-term, early long-term and late long-term timeframes. The LLT acreages represent the total amount of habitat that would be affected over the 50-year life of the BDCP and do not reflect habitat increases that would result from restoration, creation and protection activities.

[d] Periodic effects were estimated for the late long-term only. Yolo periodic impacts are presented as a range based on different flow regimes at the proposed notch in Fremont Weir.

[e] Restored/created and protected habitat acreages represent planned conservation activities that would be implemented over the lifetime of the BDCP (see BDCP Chapter 3, *Conservation Strategy*, for specifics).

NT = near-term
LLT = late long-term
NA = not applicable

Impact BIO-113: Loss or conversion of habitat for and direct mortality of golden eagle and ferruginous hawk

Alternative 4 conservation measures would result in the combined permanent and temporary loss of up to 3,011 acres of modeled foraging habitat for golden eagle and ferruginous hawk (of which 2,559 acres would be a permanent loss and 452 acres would be a temporary loss of habitat, Table 12-4-43). Conservation measures that would result in these losses are conveyance facilities and transmission line construction, and establishment and use of borrow and spoil areas (CM1), Yolo Bypass Fisheries Enhancement (CM2), Tidal Natural Communities Restoration (CM4), Seasonally Inundated Floodplain Restoration (CM5), Grassland Natural Community Restoration (CM8), Vernal Pool Natural Community and Alkali Seasonal Wetland Complex Restoration (CM9), Nontidal Marsh Restoration (CM10), and Conservation Hatcheries (CM18). The majority of habitat loss would result from CM4. Habitat enhancement and management activities (CM11), which include ground disturbance or removal of nonnative vegetation, could result in local adverse habitat effects. In addition, maintenance activities associated with the long-term operation of the water conveyance facilities and other BDCP physical facilities could degrade or eliminate golden eagle and ferruginous hawk foraging habitat. Each of these individual activities is described below. A summary statement of the combined impacts and NEPA and CEQA conclusions follows the individual conservation measure discussions.

- *CM1 Water Facilities and Operation*: Construction of Alternative 4 conveyance facilities would result in the combined permanent and temporary loss of up to 563 acres of modeled golden eagle and ferruginous hawk foraging habitat (308 acres of permanent loss, 255 acres of temporary loss) from CZs 3-6 and CZ 8. The majority of grassland that would be removed would be in CZ 8, from the construction of the Byron Forebay. Refer to the Terrestrial Biology Map Book for a detailed view of Alternative 4 construction locations.

  There would be an 12 acre decrease in the combined permanent and temporary loss of golden eagle and ferruginous hawk habitat associated with the construction of the east-west transmission line for the Alternative 4 water conveyance facilities rather than the north-south transmission line.

- *CM2 Yolo Bypass Fisheries Enhancement*: Construction of the Yolo bypass fisheries enhancement would permanently remove 261 acres of low-value modeled golden eagle and ferruginous hawk foraging habitat in the Yolo Bypass in CZ 2. In addition, 165 acres would be temporarily removed. Most of the grassland losses would occur at the north end of the bypass below Fremont Weir, along the Toe Drain/Tule Canal, and along the west side channels.

- *CM4 Tidal Natural Communities Restoration*: Tidal habitat restoration site preparation and inundation would permanently remove an estimated 1,506 acres of modeled golden eagle and ferruginous hawk foraging habitat. The majority of the losses would likely occur in the vicinity of Cache Slough, on Decker Island in the West Delta ROA, on the upslope fringes of Suisun Marsh, and along narrow bands adjacent to waterways in the South Delta ROA. Tidal restoration would directly impact and fragment remaining grassland just north of Rio Vista in and around French and Prospect Islands, and in an area south of Rio Vista around Threemile Slough.

- *CM5 Seasonally Inundated Floodplain Restoration*: Construction of setback levees to restore seasonally inundated floodplain would permanently and temporarily remove approximately 481 acres of modeled golden eagle and ferruginous hawk foraging habitat (449 permanent, 32 temporary). These losses would be expected to occur along the San Joaquin River and other major waterways in CZ 7.

- *CM8 Grassland Natural Community Restoration* and *CM9 Verna Pool and Alkali Seasonal Wetland Complex Restoration*: Temporary construction-related disturbance of grassland habitat would result from implementation of CM8 and CM9 in CZs 1, 8, and 11. However, all areas would be restored to their original or higher value habitat after the construction periods. The resulting restoration of 2,000 acres of grassland would benefit golden eagle and ferruginous hawk.

- *CM11 Natural Communities Enhancement and Management:* The protection of 8,000 acres of grassland for covered species is also expected to benefit golden eagle by protecting existing habitats from potential loss or degradation that otherwise could occur with future changes in existing land use. Habitat management and enhancement-related activities could cause disturbance to golden eagle or ferruginous hawk if they are present near work areas. However, these activities are not expected to result in direct mortality of these species, as birds would be expected to avoid contact with construction and other equipment. Thus, habitat management and enhancement-related activities would not have an adverse effect on golden eagle and ferruginous hawk.

A variety of habitat management actions that are designed to enhance wildlife values in restored or protected habitats could result in localized ground disturbances that could temporarily remove small amounts of golden eagle or ferruginous hawk foraging habitat. Ground-disturbing activities, such as removal of nonnative vegetation and road and other infrastructure maintenance activities, would be expected to have minor adverse effects on available foraging habitat and would be expected to result in overall improvements to and maintenance of habitat values over the term of the BDCP. Noise and visual disturbance from management-related equipment operation could temporarily displace individuals or alter the foraging behavior of golden eagle or ferruginous hawk if adjacent to work areas. With full implementation of the BDCP, enhancement and management actions designed for western burrowing owl would also be expected to benefit these species. Golden eagle and ferruginous hawk would benefit particularly from protection of grassland habitat against potential loss or degradation that otherwise could occur with future changes in existing land use. Habitat enhancement actions to increase small mammal abundance in protected habitats would also benefit these species.

- *CM18 Conservation Hatcheries*: Implementation of CM18 would remove up to 35 acres of golden eagle and ferruginous hawk foraging habitat.
- Operations and Maintenance: Postconstruction operation and maintenance of the above-ground water conveyance facilities and restoration infrastructure could result in ongoing but periodic disturbances that could affect golden eagle and ferruginous hawk use of the surrounding habitat. Maintenance activities would include vegetation management, levee and structure repair, and re-grading of roads and permanent work areas. These effects, however, would be reduced by AMMs and conservation actions as described below.
- Injury and Direct Mortality: Construction would not be expected to result in direct mortality of golden eagle and ferruginous hawk because foraging individuals would be expected to temporarily avoid the increased noise and activity associated with construction areas.

The following paragraphs summarize the combined effects discussed above and describe other BDCP conservation actions that offset or avoid these effects. NEPA and CEQA impact conclusions are also included.

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the effects of construction would not be adverse under NEPA and would be less than significant under CEQA. The Plan would remove 1,679 acres of modeled (1,259 permanent, 420 temporary) foraging habitat for golden eagle and ferruginous hawk in the study area in the near-term. These effects would result from the construction of the water conveyance facilities (CM1, 563 acres), and implementing other conservation measures (Yolo Bypass Fisheries Enhancement [CM2] Tidal Natural Communities Restoration [CM4], Seasonally Inundated Floodplain Restoration [CM5], Grassland Natural Community Restoration [CM8], Vernal Pool and Alkali Seasonal Wetland Complex Restoration [CM9], and Conservation Hatcheries [CM18] 1,116 acres).

Typical NEPA and CEQA project-level mitigation ratios for those natural communities affected by CM1 would be 2:1 protection of grassland habitat. Using these typical ratios would indicate that 1,126 acres of grassland natural communities should be protected to mitigate for the CM1 losses of

563 acres of golden eagle and ferruginous hawk modeled foraging habitat. The offsetting acreage would need to be 1,102 acres of protection if the east-west transmission line alignment was selected for Alternative 4 (to compensate for the 551 acre loss of foraging habitat). The near-term effects of other conservation actions would remove 1,116 acres of modeled habitat, and therefore require 2,232 acres of protection of golden eagle and ferruginous hawk habitat using the same typical NEPA and CEQA ratio of 2:1 for protection.

The BDCP has committed to near-term goals of protecting 2,000 acres and restoring 1,140 acres of grassland natural community in CZs 1, 2, 4, 5, 7, 8, and 11. The protection and restoration of grasslands, would result in a contiguous matrix of grassland, alkali seasonal wetland, and vernal pool natural communities which would expand foraging habitat for golden eagle and ferruginous hawk and reduce the effects of current levels of habitat fragmentation. Under *CM11 Natural Communities Enhancement and Management*, small mammal and insect prey populations would be increased on protected lands, enhancing the foraging value of these natural communities. In addition, burrow availability would be increased on protected natural communities by encouraging ground squirrel occupancy and expansion through the creation of berms, mounds, edges, and through the prohibition of ground squirrel control programs (i.e., poisoning).

These natural community biological goals and objectives would inform the near-term protection and restoration efforts and represent performance standards for considering the effectiveness of restoration actions for the species. The acres of protection and restoration contained in the near-term Plan goals alone would not serve as compensation for near-term impacts. However, with the addition of the management and enhancement activities described above through *CM3* and *CM11*, the project-level effects of CM1 and the habitat loss occurring from other conservation actions in the near-term time period would not be adverse.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training*, *AMM2 Construction Best Management Practices and Monitoring, AMM3 Stormwater Pollution Prevention Plan*, *AMM4 Erosion and Sediment Control Plan*, *AMM5 Spill Prevention, Containment, and Countermeasure Plan*, *AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan*, *AMM7 Barge Operations Plan*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas and disposal sites. The AMMs are described in detail in BDCP Appendix 3.C.

Late Long-Term Timeframe

The study area supports approximately 78,624 acres of modeled foraging habitat for golden eagle and ferruginous hawk. Alternative 4 as a whole would result in the permanent loss of and temporary effects on 3,011 acres of modeled foraging habitat during the term of the Plan (4% of the modeled habitat in the study area). The locations of these losses are described above in the analyses of individual conservation measures. The Plan includes a commitment to restore or create at least 2,000 acres of grassland in CZs 1, 8, and 11 and to protect 8,000 acres of grassland (with at least 2,000 acres protected in CZ 1, at least 1,000 acres in CZ 8, at least 2,000 acres protected in CZ 11, and the remainder distributed throughout CZs 1, 2, 4, 5, 7, 8, and 11 in the study area. All protected habitat would be managed under *CM11 Natural Communities Enhancement and Management* to increase small mammal and insect prey populations on protected lands, enhancing the foraging value of these natural communities. In addition, burrow availability would be increased on protected natural communities by encouraging ground squirrel occupancy and expansion through the creation of berms, mounds, edges, and through the prohibition of ground squirrel control programs (i.e., poisoning).

The loss of golden eagle and ferruginous hawk habitat associated with Alternative 4 would represent an adverse effect as a result of habitat modification of special-status species and potential for mortality in the absence of other conservation actions. However, with habitat protection and restoration associated with CM3, CM8, and CM11, guided by biological goals and objectives and AMM1–AMM7, which would be in place throughout the time period any construction activity would be occurring, the effects of habitat loss and potential mortality under Alternative 4 on golden eagle and ferruginous hawk would not be adverse under NEPA.

CEQA Conclusion: Alternative 4 (CM1–CM5, and CM11) would have both temporary and permanent impacts on golden eagle and ferruginous hawk and their modeled habitat and operation of construction equipment could disturb individuals, if present in the study area.

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the impacts of construction would be less than significant under CEQA. The Plan would remove 1,679 acres of modeled (1,259 permanent, 420 temporary) foraging habitat for golden eagle and ferruginous hawk in the study area in the near-term. These impacts would result from the construction of the water conveyance facilities (CM1, 563 acres), and implementing other conservation measures (Yolo Bypass Fisheries Enhancement [CM2] Tidal Natural Communities Restoration [CM4], Seasonally Inundated Floodplain Restoration [CM5], Grassland Natural Community Restoration [CM8], Vernal Pool and Alkali Seasonal Wetland Complex Restoration [CM9], and Conservation Hatcheries [CM18] 1,116 acres).

Typical NEPA and CEQA project-level mitigation ratios for those natural communities affected by CM1 would be 2:1 protection of grassland habitat. Using these typical ratios would indicate that 1,126 acres of grassland natural communities should be protected to mitigate for the CM1 losses of 563 acres of golden eagle and ferruginous hawk modeled foraging habitat. The offsetting acreage would need to be 1,102 acres of protection if the east-west transmission line alignment was selected for Alternative 4 (to compensate for the 551 acre loss of foraging habitat). The near-term effects of other conservation actions would remove 1,116 acres of modeled habitat, and therefore require 2,232 acres of protection of golden eagle and ferruginous hawk habitat using the same typical NEPA and CEQA ratio of 2:1 for protection.

The BDCP has committed to near-term goals of protecting 2,000 acres and restoring 1,140 acres of grassland natural community in CZs 1, 2, 4, 5, 7, 8, and 11. The protection and restoration of grasslands, would result in a contiguous matrix of grassland, alkali seasonal wetland, and vernal pool natural communities which would expand foraging habitat for golden eagle and ferruginous hawk and reduce the effects of current levels of habitat fragmentation. Under *CM11 Natural Communities Enhancement and Management*, small mammal and insect prey populations would be increased on protected lands, enhancing the foraging value of these natural communities. In addition, burrow availability would be increased on protected natural communities by encouraging ground squirrel occupancy and expansion through the creation of berms, mounds, edges, and through the prohibition of ground squirrel control programs (i.e., poisoning).

These natural community biological goals and objectives would inform the near-term protection and restoration efforts and represent performance standards for considering the effectiveness of restoration actions for the species. The acres of protection and restoration contained in the near-term Plan goals alone would not serve as compensation for near-term impacts. However, with the addition of the management and enhancement activities described above through *CM3* and *CM11*, the project-level effects of CM1 and the habitat loss occurring from other conservation actions in the near-term time period would be less than significant.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training*, *AMM2 Construction Best Management Practices and Monitoring, AMM3 Stormwater Pollution Prevention Plan*, *AMM4 Erosion and Sediment Control Plan*, *AMM5 Spill Prevention, Containment, and Countermeasure Plan*, *AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan*, *AMM7 Barge Operations Plan*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas and disposal sites. The AMMs are described in detail in BDCP Appendix 3.C.

Late Long-Term Timeframe

The study area supports approximately 78,624 acres of modeled foraging habitat for golden eagle and ferruginous hawk. Alternative 4 as a whole would result in the permanent loss of and temporary effects on 3,011 acres of modeled foraging habitat during the term of the Plan (4% of the modeled habitat in the study area). The locations of these losses are described above in the analyses of individual conservation measures. The Plan includes a commitment to restore or create at least 2,000 acres of grassland in CZs 1, 8, and 11 and to protect 8,000 acres of grassland (with at least 2,000 acres protected in CZ 1, at least 1,000 acres in CZ 8, at least 2,000 acres protected in CZ 11, and the remainder distributed throughout CZs 1, 2, 4, 5, 7, 8, and 11. All protected habitat would be managed under *CM11 Natural Communities Enhancement and Management* to increase small mammal and insect prey populations on protected lands, enhancing the foraging value of these natural communities. In addition, burrow availability would be increased on protected natural communities by encouraging ground squirrel occupancy and expansion through the creation of berms, mounds, edges, and through the prohibition of ground squirrel control programs (i.e., poisoning).

Considering these protection and restoration provisions, which would provide acreages of new high-value or enhanced habitat in amounts suitable to compensate for habitats lost to construction and restoration activities, and implementation of AMM1–AMM7, the loss of habitat or direct mortality through implementation of Alternative 4 would not result in a substantial adverse effect through habitat modifications and would not substantially reduce the number or restrict the range of either species. Therefore, the loss of habitat or potential mortality under this alternative would have a less-than-significant impact on golden eagle and ferruginous hawk.

Impact BIO-114: Effects on golden eagle and ferruginous hawk associated with electrical transmission facilities

New transmission lines would increase the risk that golden eagles and ferruginous hawks could be subject to power line strikes, which could result in injury or mortality of these species. Golden eagle and ferruginous hawk would be at low risk of bird strike mortality based on factors assessed in the bird strike vulnerability analysis (BDCP Attachment 5.J-2, *Memorandum: Analysis of Potential Bird Collisions at Proposed BDCP Transmission Lines*). Factors analyzed include the height of the new transmission lines and the flight behavior of species. The existing network of transmission lines in the Plan Area currently poses the same small risk for golden eagle and ferruginous hawk, and any incremental risk associated with the new power line corridors would also be expected to be low. *AMM20 Greater Sandhill Crane,* would further reduce any potential adverse effects.

CEQA Conclusion: New transmission lines would minimally increase the risk for golden eagle and ferruginous hawk power line strikes. *AMM20 Greater Sandhill Crane*, would reduce the potential impact of the construction of new transmission lines on golden eagle and ferruginous hawk to a less-than-significant level.

Impact BIO-115: Indirect effects of plan implementation on golden eagle and ferruginous hawk

Construction- and subsequent maintenance-related noise and visual disturbances could disrupt foraging, and reduce the functions of suitable foraging habitat for golden eagle and ferruginous hawk. Indirect effects associated with construction include noise, dust, and visual disturbance caused by grading, filling, contouring, and other ground-disturbing operations. The use of mechanical equipment during water conveyance facilities construction could cause the accidental release of petroleum or other contaminants that could affect these species or their prey in the surrounding habitat. AMM1–AMM7, including *AMM2 Construction Best Management Practices and Monitoring*, would minimize the likelihood of such spills from occurring. The inadvertent discharge of sediment or excessive dust adjacent to golden eagle and ferruginous hawk grassland habitat could also have a negative effect on the species. However, AMM1–AMM7 would also ensure that measures would be in place to prevent runoff from the construction area and the negative effects of dust on wildlife adjacent to work areas.

CEQA Conclusion: With the incorporation of AMM1–AMM7 into the BDCP, indirect effects as a result of constructing the water conveyance facilities would have a less-than-significant impact on golden eagle and ferruginous hawk.

Impact BIO-116: Periodic effects of inundation on golden eagle and ferruginous hawk habitat as a result of implementation of conservation components

Flooding of the Yolo Bypass from Fremont Weir operations (*CM2 Yolo Bypass Fisheries Enhancement*) would increase the frequency and duration of inundation on approximately 386–1,277 acres of modeled golden eagle and ferruginous hawk foraging habitat (Table 12-4-43).

Based on hypothetical footprints, implementation of *CM5 Seasonally Inundated Floodplain Restoration*, could result in the periodic inundation of up to approximately 513 acres of modeled habitat (Table 12-4-43).

Golden eagles and ferruginous hawks would not likely use inundated areas for foraging, and increased inundation frequency and duration of inundation of grassland habitats may affect prey populations that have insufficient time to recover following inundation events. nesting burrows. Periodic inundation would at a maximum, remove 2% of the available foraging habitat in the Plan Area. Thus, periodically inundated habitat would not be expected to have an adverse effect on local or migratory golden eagles or the wintering ferruginous hawk population in the area.

CEQA Conclusion: Implementation of CM2 would increase the frequency and duration of inundation on approximately 386–1,277 acres of modeled golden eagle and ferruginous hawk foraging habitat.

In addition, implementation of CM5 could result in the periodic inundation of up to 513 acres of modeled habitat. Periodic inundation would be expected to have a less-than-significant impact on the population.

Cormorants, Herons and Egrets

This section describes the effects of Alternative 4, including water conveyance facilities construction and implementation of other conservation components, on double-crested cormorant, great blue heron, great egret, snowy egret, and black-crowned night heron. Modeled breeding habitat for these species consists of valley/foothill riparian forest.

Construction and restoration associated with Alternative 4 conservation measures would result in both temporary and permanent losses of cormorant, heron, and egret modeled habitat as indicated in Table 12-4-44. Full implementation of Alternative 4 actions that are expected to affect cormorants, herons, and egrets, would restore or create 5,000 acres, and protect 750 acres of riparian habitat, and restore 55,000 acres of tidal natural communities. In addition, temporarily affected riparian areas would be restored as riparian habitat within 1 year following completion of construction activites. Although 800 acres of riparian habitat would be restored in the near-term, it could take 1 or more decades for trees to grow to a suitable size for several of these species to nest. This time lag between impacts and restoration of habitat function would be minimized through specific tree planting requirements of *AMM18 Swainson's Hawk and White-Tailed Kite*, including number of plantings, location, species of trees, and monitoring, associated with restoration success. Furthermore, restoration to offset impacts on nesting habitat within the first 10 years would be initiated within 18 months of Plan approval. As explained below, with the restoration or protection of these amounts of habitat, applicable AMMs and mitigation measures to avoid impacts on nests, impacts to cormorants, herons, and egrets would not be adverse for NEPA purposes and would be less than significant for CEQA purposes.

Table 12-4-44. Changes in Cormorant, Heron and Egret Modeled Habitat Associated with Alternative 4 (acres)[a]

	Conservation Measure[b]	Habitat Type	Permanent		Temporary		Periodic[d]	
			NT	LLT	NT	LLT	Yolo	Floodplain
Habitat Affected[c]	CM1	Nesting (Rookeries)	49	49	25	25	NA	NA
	Total Impacts CM1		**49**	**49**	**25**	**25**		
	CM2–CM18	Nesting (Rookeries)	527	824	149	184	72–92	265
	Total Impacts CM2–CM18		**527**	**824**	**149**	**184**	**72–92**	**265**
	TOTAL IMPACTS		**576**	**873**	**174**	**209**	**72–92**	**265**
Habitat Restored/ Created[e]	CM7		800	5,000	NA	NA	NA	NA
	Total Restoration/Creation		**800**	**5,000**				
Habitat Protected[e]	CM4 tidal restoration		750	NA	NA	NA	NA	NA
	Total Protection		**750**					

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late long-term timeframes.

[b] See discussion below for a description of applicable CMs.

[c] LLT acreages are a summation of effects that would occur in the near-term, early long-term and late long-

term timeframes. The LLT acreages represent the total amount of habitat that would be affected over the 50-year life of the BDCP and do not reflect habitat increases that would result from restoration, creation and protection activities.

[d] Periodic effects were estimated for the late long-term only. Yolo periodic impacts are presented as a range based on different flow regimes at the proposed notch in Fremont Weir.

[e] Restored/created and protected habitat acreages represent planned conservation activities that would be implemented over the lifetime of the BDCP (see BDCP Chapter 3, *Conservation Strategy*, for specifics).

NT = near-term
LLT = late long-term
NA = not applicable

Impact BIO-117: Loss or conversion of nesting habitat and direct mortality of cormorants, herons and egrets

Alternative 4 conservation measures would result in the combined permanent and temporary loss of up to 1,082 acres of modeled habitat for double-crested cormorant, great blue heron, great egret, snowy egret, and black-crowned night heron (Table 12-4-44). Conservation measures that would result in these losses are Water Facilities and Operation (CM1) (which would involve construction of conveyance facilities and transmission lines and establishment and use of borrow and spoil areas), Yolo Bypass Fisheries Enhancement (CM2), Tidal Natural Communities Restoration (CM4), and Seasonally Inundated Floodplain Restoration (CM5). Habitat enhancement and management activities (CM11), which include ground disturbance or removal of nonnative vegetation, could result in local adverse habitat effects. In addition, maintenance activities associated with the long-term operation of the water conveyance facilities and other BDCP physical facilities could degrade or eliminate cormorant, heron, and egret modeled habitat. Each of these individual activities is described below. A summary statement of the combined impacts and NEPA and CEQA conclusions follows the individual conservation measure discussions.

- *CM1 Water Facilities and Operation*: Construction of Alternative 4 water conveyance facilities would result in the combined permanent and temporary loss of up to 74 acres of modeled Cormorant, heron, and egret habitat (Table 12-4-44). Of the 74 acres of modeled habitat that would be removed for the construction of the conveyance facilities, 49 acres would be a permanent loss and 25 acres would be a temporary loss of habitat. This loss would have the potential to displace individuals, if present, and remove the functions and value of potentially suitable habitat. Activities that would impact modeled habitat consist of tunnel, forebay, and intake construction, temporary access roads, and construction of transmission lines. Impacts from CM1 would occur in the central delta in CZ 3, CZ 4, CZ 5, CZ 6, and CZ 8. Refer to the Terrestrial Biology Map Book for a detailed view of Alternative 4 construction locations.

  There would be a 6 acre increase in the combined permanent and temporary loss of cormorant, heron, and egret habitat associated with the construction of the east-west transmission line for the Alternative 4 water conveyance facility rather than the north-south transmission line.

- *CM2 Yolo Bypass Fisheries Enhancement:* Construction of the Yolo bypass fisheries enhancement—specifically, construction of conveyance channels extending from the Sacramento River to the weir and from the weir into the Yolo Bypass—would permanently remove approximately 229 acres of suitable cormorants, heron, and egret nesting habitat. In addition, levee reinforcement activities would temporarily remove 149 acres of nesting habitat.

- *CM4 Tidal Natural Communities Restoration*: Restoration could permanently remove up to 552 acres of potential cormorant, heron, and egret nesting habitat.
- *CM5 Seasonally Inundated Floodplain Restoration:* Construction of setback levees to restore seasonally inundated floodplain (CM5) would permanently remove approximately 43 acres and temporarily remove approximately 35 acres of potential cormorants, heron, and egret nesting habitat.
- *CM6 Channel Margin Enhancement:* Approximately 37 acres of valley/foothill riparian habitat would be restored as a component of channel margin enhancement actions along 20 miles of river and slough channels in the Delta. Another 37 acres of riparian habitat would be restored if 20 more miles of channel margin were enhanced under adaptive management. Some of the restored riparian habitat in the channel margin would be expected to support nesting habitat for cormorants, herons, and egrets.
- *CM11 Natural Communities Enhancement and Management:* Habitat management- and enhancement-related activities could disturb cormorant, heron, and egret nests if they were present near work sites. A variety of habitat management actions included in *CM11 Natural Communities Enhancement and Management* that are designed to enhance wildlife values in BDCP-protected habitats may result in localized ground disturbances that could temporarily remove small amounts of cormorant, heron, and egret habitat and reduce the functions of habitat until restoration is complete. Ground-disturbing activities, such as removal of nonnative vegetation and road and other infrastructure maintenance, are expected to have minor effects on available habitat for these species and are expected to result in overall improvements to and maintenance of habitat values over the term of the BDCP. These effects cannot be quantified, but are expected to be minimal and would be avoided and minimized by the AMMs listed below.
- Permanent and temporary habitat losses from the above conservation measures would primarily consist of fragmented riparian stands in CZs 2, 3, 4, 5, 6, 7, and 8. Temporarily affected areas would be restored as riparian habitat within 1 year following completion of construction activities. Although the effects are considered temporary, the restored riparian habitat would require 1 to several decades to functionally replace habitat that has been affected and for trees to attain sufficient size and structure suitable for nesting for cormorants, herons and egrets. The restored riparian habitats would be designed to provide future nesting habitat in large contiguous patches over the term of the BDCP in order to increase nesting opportunities for the species.
- Operations and Maintenance: Postconstruction operation and maintenance of the above-ground water conveyance facilities and restoration infrastructure could result in ongoing but periodic disturbances that could affect use of the surrounding habitat by cormorants, herons or egrets. Maintenance activities would include vegetation management, levee and structure repair, and re-grading of roads and permanent work areas. These effects, however, would be reduced by AMMs and conservation actions as described below.
- The primary impact of concern regarding double-crested cormorant, great blue heron, great egret, snowy egret, and black-crowned night heron is the loss of existing known nest trees, and other large trees associated with known nest sites. Because these species are highly traditional in their use of rookeries, the establishment of new nest sites is unpredictable. There is one great blue heron nest occurrence that overlaps with the proposed permanent powerline associated with CM1, east of Little Mandeville Island. To avoid adverse effects to these species, existing known nest sites would have to be avoided. Mitigation Measure BIO-75, *Conduct preconstruction*

nesting bird surveys and avoid disturbance of nesting birds, would be available to address these potential adverse effects on cormorants, herons, and egrets.

- Injury and Direct Mortality: Construction-related activities would not be expected to result in direct mortality of adult or fledged double-crested cormorant, great blue heron, great egret, snowy egret, and black-crowned night heron if they were present in the Plan Area, because they would be expected to avoid contact with construction and other equipment. If birds were to nest in the construction area, construction-related activities, including equipment operation, noise and visual disturbances could affect nests or lead to their abandonment, potentially resulting in mortality of eggs and nestlings. Mitigation Measure BIO-75 would be available to address these potential adverse effects on cormorants, herons, and egrets.

The following paragraphs summarize the combined effects discussed above and describe other BDCP conservation actions that offset or avoid these effects. NEPA and CEQA impact conclusions are also included.

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the effects of construction would not be adverse under NEPA. The Plan would remove 750 acres of breeding habitat for cormorants, herons, and egrets in the study area in the near-term. These effects would result from the construction of the water conveyance facilities (CM1, 74 acres of breeding habitat), and implementing other conservation measures (*CM2 Yolo Bypass Fisheries Enhancement*, *CM4 Tidal Natural Communities Restoration*, and *CM5 Seasonally Inundated Floodplain Restoration*—676 acres of breeding habitat).

Typical NEPA and CEQA project-level mitigation ratios for those natural communities affected by CM1 would be 1:1 for restoration/creation and 1:1 protection of valley/foothill riparian habitat for breeding habitat. Using these typical ratios would indicate that 74 acres of breeding habitat should be restored/created and 74 acres should be protected to mitigate for the CM1 losses of modeled cormorant, heron, and egret habitat. The offsetting acreage would need to be 80 acres each of restoration and protection if the east-west transmission line alignment was selected for Alternative 4. In addition, the near-term effects of other conservation actions would remove 676 acres of modeled breeding habitat, and therefore require 676 acres of restoration and 676 acres of protection of modeled cormorant, heron, and egret habitat using the same typical NEPA and CEQA ratios.

Double-crested cormorant, great blue heron, great egret, snowy egret, and black-crowned night heron are not species that are covered under the BDCP. Because these species are highly traditional in their use of rookeries, the establishment of new nest sites is unpredictable. Construction of the water conveyance facility includes a permanent transmission line impact that overlaps with a great blue heron known nest occurrence. To avoid adverse effects to individuals, existing nests and rookeries would have to be avoided. In addition, preconstruction surveys would be required to ensure that all active nests are detected and avoided. Mitigation Measure BIO-75, *Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds*, would be available to address these potential adverse effects on cormorants, herons, and egrets. Approximately 298 acres of modeled nesting habitat would be impacted as a result of *CM4 Tidal Natural Communities Restoration*. Trees would not be actively removed but tree mortality would be expected over time as areas became tidally inundated. Restoration projects under CM4 would be prioritized in areas where tidal habitat restoration would not adversely affect mature riparian stands in the near-term time period, which would reduce near-term impacts on cormorants, herons and egrets.

The BDCP has committed to near-term goals of protecting 750 acres and restoring 800 acres of the valley/foothill riparian natural community. In addition, temporarily disturbed habitat would be restored following the completion of construction. Riparian restoration actions through CM6, CM7, and CM11 would expand the patches of existing riparian forest in order to improve nesting habitat for riparian species in the Plan Area.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training, AMM2 Construction Best Management Practices and Monitoring, AMM3 Stormwater Pollution Prevention Plan, AMM4 Erosion and Sediment Control Plan, AMM5 Spill Prevention, Containment, and Countermeasure Plan, AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan, and AMM7 Barge Operations Plan*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas and disposal sites. The AMMs are described in detail in BDCP Appendix 3.C.

The acres of protection contained in the near-term Plan goals satisfy the typical mitigation ratios that would be applied to the project-level effects of CM1. The 800 acres of riparian habitat restoration would be initiated in the near-term to offset the loss of 750 acres of modeled nesting habitat. However, it would take 1 to several decades for restored habitat to functionally replace habitat that has been affected and for the trees to attain sufficient size and structure suitable for nesting great egrets, cormorants, and great blue herons. This time lag between the removal and restoration of nesting habitat could have a substantial impact on these species in the near-term time period. *AMM18 Swainson's Hawk and White-Tailed Kite* includes the requirement that three 5-gallon trees be planted for each potential nest tree (i.e., trees that are large enough to provide potential habitat for Swainson's hawk and white-tailed kite) expected to be removed during the near-term period. Tree plantings that were incorporated into riparian habitat restoration under CM7 would also benefit cormorants, herons and egrets. To further offset near-term impacts, under AMM18, a variety of native tree species with differing growth rates would be planted. This variety would ensure that nesting habitat is available quickly (approximately 10 years for cottonwoods and willows) and in the longer term (valley oaks, black walnuts, and sycamores). Nesting tree replacement planting would occur within 18 months of Plan approval and a monitoring and maintenance plan described in CM11 would ensure the establishment and survival of planted trees. For all of these reasons, Alternative 4 would not have a substantial adverse effect on cormorants, herons, or egrets in the near-term timeframe, either through direct mortality or through habitat modifications.

Late Long-Term Timeframe

Based on modeled habitat, the study area supports approximately 18,132 acres of modeled breeding habitat for cormorants, herons, and egrets. Alternative 4 as a whole would result in the permanent loss of and temporary effects on 1,082 acres of potential breeding habitat (6% of the potential breeding habitat in the Plan Area). The Plan includes a commitment to restore or create at least 5,000 acres of valley/foothill riparian woodland in CZ 4 and/or CZ 7 and protect at least 750 acres of valley/foothill riparian woodland in CZ 7. Riparian restoration actions through CM7 and CM11 would expand the patches of existing riparian forest in order to improve nesting habitat for cormorants, herons, and egrets in the Plan Area. In addition, approximately 37 acres of valley/foothill riparian habitat would be restored as a component of channel margin enhancement actions (CM6) along 20 miles of river and slough channels in the Delta. Another 37 acres of riparian habitat would be restored if 20 more miles of channel margin were enhanced under adaptive management. Some of the restored riparian habitat in the channel margin would be expected to support nesting habitat for cormorants, herons, and egrets. The restoration of 55,000 acres of tidal natural communities would also enhance foraging habitat for cormorants, herons, and eagles.

The loss of cormorant, heron, and egret habitat associated with Alternative 4 would represent an adverse effect as a result of habitat modification of a special-status species and potential for direct mortality in the absence of other conservation actions. Double-crested cormorant, great blue heron, great egret, snowy egret, and black-crowned night heron are not species that are covered under the BDCP. Because these species are highly traditional in their use of rookeries, the establishment of new nest sites is unpredictable. To avoid adverse effects to these species, existing known nest sites would have to be avoided. In addition, preconstruction surveys would be required to ensure that all nests are detected and avoided. Mitigation Measure BIO-75 would be available to address these potential adverse effects on cormorants, herons, and egrets. With habitat protection and restoration associated with CM3, CM5, CM6, CM7, and CM11, guided by biological goals and objectives and AMM1–AMM7, which would be in place throughout the time period any construction activity would be occurring, the effects of habitat loss and potential mortality under Alternative 4 on cormorants, herons, and egrets would not be adverse under NEPA.

CEQA Conclusion: Alternative 4 (CM1–CM11) would have both temporary and permanent impacts on cormorants, herons, and egrets and their modeled habitat and operation of construction equipment could injure or disturb individuals, if present in the study area. In addition, because these species are highly traditional in their use of rookeries, the establishment of new nest sites is unpredictable and to avoid significant impacts on these species, existing known nest sites would have to be avoided.

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the impacts of construction would be less than significant under CEQA. The Plan would remove 750 acres of breeding habitat for cormorants, herons, and egrets in the study area in the near-term. These impacts would result from the construction of the water conveyance facilities (CM1, 74 acres of breeding habitat), and implementing other conservation measures (*CM2 Yolo Bypass Fisheries Enhancemen*t, *CM4 Tidal Natural Communities Restoration*, and *CM5 Seasonally Inundated Floodplain Restoration*—676 acres of breeding habitat).

Typical NEPA and CEQA project-level mitigation ratios for those natural communities affected by CM1 would be 1:1 for restoration/creation and 1:1 protection of valley/foothill riparian habitat for breeding habitat. Using these typical ratios would indicate that 74 acres of breeding habitat should be restored/created and 74 acres should be protected to mitigate for the CM1 losses of modeled cormorant, heron, and egret habitat. The offsetting acreage would need to be 80 acres each of restoration and protection if the east-west transmission line alignment was selected for Alternative 4. In addition, the near-term effects of other conservation actions would remove 676 acres of modeled breeding habitat, and therefore require 676 acres of restoration and 676 acres of protection of modeled cormorant, heron, and egret habitat using the same typical NEPA and CEQA ratios.

Double-crested cormorant, great blue heron, great egret, snowy egret, and black-crowned night heron are not species that are covered under the BDCP. Because these species are highly traditional in their use of rookeries, the establishment of new nest sites is unpredictable. Construction of the water conveyance facility includes a permanent transmission line impact that overlaps with a great blue heron known nest occurrence. To avoid adverse effects to individuals, existing nests and rookeries would have to be avoided. In addition, preconstruction surveys would be required to ensure that all nests are detected and avoided. The implementation of Mitigation Measure BIO-75, *Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds*, and the avoidance of existing nest sites and rookeries would reduce potential adverse effects on individual nesting cormorants, herons, and egrets to a less-than-significant level. Approximately 298 acres of modeled nesting habitat would be impacted as a result of *CM4 Tidal Natural Communities Restoration*. Trees would not be actively removed but tree mortality would be expected over time as areas became tidally inundated. Restoration projects under CM4 would be prioritized in areas where tidal habitat restoration would not adversely affect mature riparian stands in the near-term time period, which would reduce near-term impacts on cormorants, herons and egrets.

The BDCP has committed to near-term goals of protecting 750 acres and restoring 800 acres of the valley/foothill riparian natural community. Riparian restoration actions through CM6, CM7, and CM11 would expand the patches of existing riparian forest in order to improve nesting habitat for riparian species in the Plan Area.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training, AMM2 Construction Best Management Practices and Monitoring, AMM3 Stormwater Pollution Prevention Plan, AMM4 Erosion and Sediment Control Plan, AMM5 Spill Prevention, Containment, and Countermeasure Plan, AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan, and AMM7 Barge Operations Plan*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas and disposal sites. The AMMs are described in detail in BDCP Appendix 3.C.

The acres of protection contained in the near-term Plan goals satisfy the typical mitigation ratios that would be applied to the project-level effects of CM1. The 800 acres of riparian habitat restoration would be initiated in the near-term to offset the loss of 750 acres of modeled nesting habitat. However, it would take 1 to several decades for restored habitat to functionally replace habitat that has been affected and for the trees to attain sufficient size and structure suitable for nesting great egrets, cormorants, and great blue herons. This time lag between the removal and restoration of nesting habitat could have a substantial impact on these species in the near-term time period. *AMM18 Swainson's Hawk and White-Tailed Kite* includes the requirement that three 5-gallon trees be planted for each potential nest tree (i.e., trees that are large enough to provide potential habitat for Swainson's hawk and white-tailed kite) expected to be removed during the near-term period. Tree plantings that were incorporated into riparian habitat restoration under CM7 would also benefit cormorants, herons and egrets. To further offset near-term impacts, under AMM18, a variety of native tree species with differing growth rates would be planted. This variety would ensure that nesting habitat is available quickly (approximately 10 years for cottonwoods and willows) and in the longer term (valley oaks, black walnuts, and sycamores). Nesting tree replacement planting would occur within 18 months of Plan approval and a monitoring and maintenance plan described in CM11 would ensure the establishment and survival of planted trees. For all of these reasons, Alternative 4 would not have a substantial adverse effect on cormorants, herons, or egrets in the near-term timeframe, either through direct mortality or through habitat modifications. The impact would be less than significant.

Late Long-Term Timeframe

Based on modeled habitat, the study area supports approximately 18,132 acres of modeled breeding habitat for cormorants, herons, and egrets. Alternative 4 as a whole would result in the permanent loss of and temporary effects on 1,082 acres of potential breeding habitat (6% of the potential breeding habitat in the Plan Area). The Plan includes a commitment to restore or create at least 5,000 acres of valley/foothill riparian woodland in CZ 4 and/or CZ 7 and protect at least 750 acres of valley/foothill riparian woodland in CZ 7. Riparian restoration actions through CM7 and CM11 would expand the patches of existing riparian forest in order to improve nesting habitat for cormorants, herons, and egrets in the Plan Area. In addition, approximately 37 acres of valley/foothill riparian habitat would be restored as a component of channel margin enhancement actions (CM6) along 20 miles of river and slough channels in the Delta. Another 37 acres of riparian habitat would be restored if 20 more miles of channel margin were enhanced under adaptive management. Some of the restored riparian habitat in the channel margin would be expected to support nesting habitat for cormorants, herons, and egrets. The restoration of 55,000 acres of tidal natural communities would also enhance foraging habitat for cormorants, herons, and eagles.

Considering these protection and restoration provisions, which would provide acreages of new or enhanced habitat in amounts sufficient to compensate for the loss of riparian habitats lost to construction and restoration activities, and implementation of AMM1–AMM7, and Mitigation Measure BIO-75, the loss of habitat or direct mortality through implementation of Alternative 4 would not result in a substantial adverse effect through habitat modifications and would not substantially reduce the number or restrict the range of these species. Therefore, the loss of habitat or potential mortality under this alternative would have a less-than-significant impact on cormorants, herons, and egrets.

Mitigation Measure BIO-75: Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds

See Mitigation Measure BIO-75 under Impact BIO-75.

Impact BIO-118: Effects associated with electrical transmission facilities on cormorants, herons and egrets

New transmission lines would increase the risk for bird-power line strikes, which could result in injury or mortality of cormorants, herons and egrets. *AMM20 Greater Sandhill Crane* would minimize the risk for bird-power line strikes, for tree-nesting waterbirds. This measure would ensure that conductor and ground lines are fitted with flight diverters in compliance with the best available practices, such as those specified in the USFWS Avian Protection Guidelines and would minimize the potential for an adverse effect.

CEQA Conclusion: New transmission lines would increase the risk for bird-power line strikes, which could result in injury or mortality of tree-nesting waterbirds. *AMM20 Greater Sandhill Crane*, would ensure that new transmission lines would have a less-than-significant impact on cormorants, herons and egrets.

Impact BIO-119: Indirect effects of plan implementation on cormorants, herons and egrets

Indirect construction-related effects: If cormorants, herons or egrets were to nest in or adjacent to work areas, construction and subsequent maintenance-related noise and visual disturbances could mask calls, disrupt foraging and nesting behaviors, and reduce the functions of suitable nesting habitat for these species. Mitigation Measure BIO-75, *Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds*, would avoid the potential for adverse effects of construction-related activities on survival and productivity of nesting cormorants, herons or egrets. The use of mechanical equipment during water conveyance facilities construction could cause the accidental release of petroleum or other contaminants that could affect cormorants, herons or egrets in the surrounding habitat. The inadvertent discharge of sediment or excessive dust adjacent to suitable habitat could also have an adverse effect on these species. AMM1–AMM7, including *AMM2 Construction Best Management Practices and Monitoring*, would minimize the likelihood of such spills and ensure that measures are in place to prevent runoff from the construction area and negative effects of dust on active nests.

Methylmercury Exposure: Covered activities have the potential to exacerbate bioaccumulation of mercury in avian species, including cormorants, herons or egrets. Future operational impacts under CM1 were analyzed using a DSM-2 based model to assess potential effects on mercury concentration and bioavailability resulting from proposed flows. Subsequently, a regression model was used to estimate fish-tissue concentrations under these future operational conditions (evaluated starting operations or ESO). Results indicated that changes in total mercury levels in water and fish tissues due to ESO were insignificant (see BDCP Appendix 5.D Tables 5D.4-3, 5D.4-4, and 5D.4-5).

Marsh (tidal and nontidal) and floodplain restoration have the potential to increase exposure to methylmercury. Mercury is transformed into the more bioavailable form of methylmercury in aquatic systems, especially areas subjected to regular wetting and drying such as tidal marshes and flood plains (Alpers et al. 2008). Thus, BDCP restoration activities that create newly inundated areas could increase bioavailability of mercury (see BDCP Chapter 3, *Conservation Strategy*, for details of restoration). Species sensitivity to methylmercury differs widely and there is a large amount of uncertainty with respect to species-specific effects. Increased methylmercury associated with natural community and floodplain restoration could indirectly affect on cormorants, herons or egrets, via uptake in lower tropic levels (as described in the BDCP, Appendix 5.D, *Contaminants*).

In addition, the potential mobilization or creation of methylmercury within the Plan Area varies with site-specific conditions and would need to be assessed at the project level. Measures described in Chapter 3 of the BDCP, Section 3.4.13, *CM12 Methylmercury Management* include provisions for Project-specific Mercury Management Plans. Site-specific restoration plans that address the creation and mobilization of mercury, as well as monitoring and adaptive management as described in CM12 would be available to address the uncertainty of methylmercury levels in restored tidal marsh and potential impacts on cormorants, herons or egrets.

CEQA Conclusion: Impacts of noise, the potential for hazardous spills, increased dust and sedimentation, and operations and maintenance of the water conveyance facilities would be less than significant with the implementation of Mitigation Measure BIO-75, *Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds*, and AMM1–AMM7. The implementation of tidal natural communities restoration or floodplain restoration could result in increased exposure of cormorants, herons or egrets to methylmercury, through the ingestion of fish in tidally restored areas. However, it is unknown what concentrations of methylmercury are harmful to these species. Site-specific restoration plans that address the creation and mobilization of mercury, as well as monitoring and adaptive management as described in CM12 would better inform potential impacts and address the uncertainty of methylmercury levels in restored tidal marsh in the study area on cormorants, herons, and egrets.

Mitigation Measure BIO-75: Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds

See Mitigation Measure BIO-75 under Impact BIO-75.

Impact BIO-120: Periodic effects of inundation on cormorants, herons and egrets as a result of implementation of conservation components

Flooding of the Yolo Bypass from Fremont Weir operations (CM2) would increase the frequency and duration of inundation of approximately 72–92 acres of modeled breeding habitat for cormorants, herons and egrets. However, increased periodic flooding is not expected to cause any adverse effect on breeding habitat because trees in which nest sites are situated already withstand floods, the increase in inundation frequency and duration is expected to remain within the range of tolerance of riparian trees, and nest sites are located above floodwaters.

Based on hypothetical floodplain restoration, CM5, implementation could result in periodic inundation of up to 265 acres of breeding habitat for cormorants, herons and egrets. The overall effect of seasonal inundation in existing riparian natural communities is likely to be beneficial for these species, because, historically, flooding was the main natural disturbance regulating ecological processes in riparian areas, and flooding promotes the germination and establishment of many native riparian plants.

CEQA Conclusion: Increased periodic flooding would not be expected to cause any adverse effect on nest sites because trees in which nest sites are situated already withstand floods, the increase in inundation frequency and duration is expected to remain within the range of tolerance of riparian trees, and nest sites are located above floodwaters. Therefore, increased duration and inundation from CM2 and CM5 would have a less-than-significant impact on cormorants, herons and egrets.

Short-Eared Owl and Northern Harrier

Modeled habitat for short-eared owl and northern harrier include tidal brackish and freshwater emergent wetland, nontidal freshwater perennial emergent wetland, other natural seasonal wetland, grassland, and selected cultivated lands.

Construction and restoration associated with Alternative 4 conservation measures would result in both temporary and permanent losses of modeled habitat for short-eared owl and northern harrier as indicated in Table 12-4-45. Full implementation of Alternative 4 would restore or create 55,000 acres of tidal natural communities, 2,000 acres of grassland natural community, and 1,200 acres of nontidal marsh. In addition, 8,000 acres of grassland, 50 acres of nontidal marsh, and 45,405 of cultivated lands would be protected (Table 12-4-45). As explained below, with the restoration or protection of these amounts of habitat, impacts on short-eared owl and northern harrier would not be adverse for NEPA purposes and would be less than significant for CEQA purposes.

Table 12-4-45. Changes in Short-Eared Owl and Northern Harrier Modeled Habitat Associated with Alternative 4 (acres)[a]

	Conservation Measure[b]	Habitat Type	Permanent		Temporary		Periodic[d]	
			NT	LLT	NT	LLT	Yolo	Floodplain
Habitat Affected[c]	CM1		1,653	1,653	787	787	NA	NA
	Total Impacts CM1		**1,653**	**1,653**	**787**	**787**		

	CM2–CM18	6,439	31,987	167	875	946–2,445	2,878
	Total Impacts CM2–CM18	**6,439**	**31,987**	**167**	**875**	**946–2,445**	**2,878**
	TOTAL IMPACTS	**8,092**	**33,640**	**954**	**1,662**	**946–2,445**	**2,878**
Habitat Restored/ Created[e]	CM4 tidal wetlands	13,800	55,000	NA	NA	NA	NA
	CM8 grassland	1,140	2,000	NA	NA	NA	NA
	CM10 nontidal marsh	400	1,200	NA	NA	NA	NA
	Total Restoration/Creation	**15,340**	**58,200**				
Habitat Protected[e]	CM3 grasslands	2,000	8,000	NA	NA	NA	NA
	CM3 cultivated lands	14,600	45,405	NA	NA	NA	NA
	CM3 nontidal marsh	35	50	NA	NA	NA	NA
	Total Protection	**16,635**	**53,455**				

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late long-term timeframes.

[b] See discussion below for a description of applicable CMs.

[c] LLT acreages are a summation of effects that would occur in the near-term, early long-term and late long-term timeframes. The LLT acreages represent the total amount of habitat that would be affected over the 50-year life of the BDCP and do not reflect habitat increases that would result from restoration, creation and protection activities.

[d] Periodic effects were estimated for the late long-term only. Yolo periodic impacts are presented as a range based on different flow regimes at the proposed notch in Fremont Weir.

[e] Restored/created and protected habitat acreages represent planned conservation activities that would be implemented over the lifetime of the BDCP (see BDCP Chapter 3, *Conservation Strategy*, for specifics).

NT = near-term

LLT = late long-term

NA = not applicable

Impact BIO-121: Loss or conversion of habitat for short-eared owl and northern harrier

Alternative 4 conservation measures would result in the combined permanent and temporary loss of up to 35,302 acres of modeled habitat for short-eared owl and northern harrier (of which 33,640 acres would be a permanent loss and 1,662 acres would be a temporary loss of habitat, Table 12-4-45). Conservation measures that would result in these losses are conveyance facilities and transmission line construction, and establishment and use of borrow and spoil areas (CM1), Yolo Bypass Fisheries Enhancement (CM2), tidal habitat restoration (CM4), floodplain restoration (CM5), grassland restoration (CM8), vernal pool and wetland restoration (CM9), marsh restoration (CM10) and construction of conservation hatcheries (CM18). The majority of habitat loss would result from CM4. Habitat enhancement and management activities (CM11), which include ground disturbance or removal of nonnative vegetation, could result in local adverse habitat effects. In addition, maintenance activities associated with the long-term operation of the water conveyance facilities and other BDCP physical facilities could degrade or eliminate short-eared owl and northern harrier modeled habitat. Each of these individual activities is described below. A summary statement of the combined impacts and NEPA and CEQA conclusions follows the individual conservation measure discussions.

- *CM1 Water Facilities and Operation:* Construction of Alternative 4 conveyance facilities would result in the combined permanent and temporary loss of up to 2,440 acres of modeled short-eared owl and northern harrier habitat (1,653 acres of permanent loss, 787 acres of temporary loss) from CZs 3–6 and CZ 8. The majority of habitat removed would be grassland and cultivated lands. Refer to the Terrestrial Biology Map Book for a detailed view of Alternative 4 construction locations.

  There would be an 136 acre decrease in the combined permanent and temporary loss of short-eared owl and northern harrier habitat associated with the construction of the east-west transmission line for the Alternative 4 water conveyance facility rather than the north-south transmission line.

- *CM2 Yolo Bypass Fisheries Enhancement:* Construction of the Yolo bypass fisheries enhancement (CM2) would permanently remove 793 acres of modeled short-eared owl and northern harrier habitat in the Yolo Bypass in CZ 2. In addition, 167 acres of grassland habitat would be temporarily removed.

- *CM4 Tidal Natural Communities Restoration:* Tidal habitat restoration site preparation and inundation would permanently remove an estimated 26,595 acres of modeled short-eared owl and northern harrier habitat. The majority of the losses would be grassland and cultivated land in CZ 1, 2, 4, 5, 6, 7, 8, 10, and 11. Tidal restoration would directly impact and fragment grassland just north of Rio Vista in and around French and Prospect Islands, and in an area south of Rio Vista around Threemile Slough. Tidal restoration actions through CM4 would restore an estimated 55,000 acres of tidal natural communities. These restored wetland areas could provide suitable nesting habitat for short-eared owl and northern harrier. Consequently, although existing nesting habitat for short-eared owl and northern harrier would be removed, restoration of wetland habitats is expected to benefit marsh associated ground nesting birds by increasing the extent and value of their nesting habitat.

- *CM5 Seasonally Inundated Floodplain Restoration:* Construction of setback levees to restore seasonally inundated floodplain (CM5) would permanently and temporarily remove approximately 4,285 acres of modeled short-eared owl and northern harrier habitat (3,577 permanent, 708 temporary). These losses would be expected to occur along the San Joaquin River and other major waterways in CZ 7.

- *CM8 Grassland Natural Community Restoration and CM9 Verna Pool and Alkali Seasonal Wetland Complex Restoration:* Temporary construction-related disturbance of grassland habitat would result from implementation of *CM8* and *CM9* in CZs 1, 8, and 11. However, all areas would be restored to their original or higher value habitat after the construction periods. The resulting restoration of 2,000 acres of grassland, would benefit short-eared owl and northern harrier.

- *CM11 Natural Communities Enhancement and Management:* The protection of 8,000 acres of grassland, 50 acres of nontidal marsh, and 45,405 acres of cultivated lands for covered species is also expected to benefit short-eared owl and northern harrier by protecting existing habitats from potential loss or degradation that otherwise could occur with future changes in existing land use. A variety of habitat management actions included in *CM11 Natural Communities Enhancement and Management* that are designed to enhance wildlife values in restored or protected habitats could result in localized ground disturbances that could temporarily remove small amounts of modeled habitat. Ground-disturbing activities, such as removal of nonnative vegetation and road and other infrastructure maintenance activities, would be expected to have minor adverse effects on available habitat and would be expected to result in overall improvements to and maintenance of habitat values over the term of the BDCP.

- Habitat management- and enhancement-related activities could short-eared owl and northern harrier nests. If either species were to nest in the vicinity of a worksite, equipment operation could destroy nests, and noise and visual disturbances could lead to their abandonment, resulting in mortality of eggs and nestlings. The potential for these activities to result in direct mortality of short-eared owl and northern harrier habitat would be minimized with the implementation of and Mitigation Measure BIO-75, *Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds*.
- *CM18 Conservation Hatcheries:* Implementation of CM18 would remove up to 35 acres of modeled short-eared owl and northern harrier habitat in CZ 2.
- Operations and Maintenance: Postconstruction operation and maintenance of the above-ground water conveyance facilities and restoration infrastructure could result in ongoing but periodic disturbances that could affect short-eared owl and northern harrier use of the surrounding habitat. Maintenance activities would include vegetation management, levee and structure repair, and re-grading of roads and permanent work areas. These effects, however, would be reduced by AMMs, Mitigation Measures, and conservation actions as described below.
- Injury and Direct Mortality: Construction-related activities would not be expected to result in direct mortality of adult or fledged short-eared owl and northern harrier if they were present in the Plan Area, because they would be expected to avoid contact with construction and other equipment. If either species were to nest in the construction area, construction-related activities, including equipment operation, noise and visual disturbances could destroy nests or lead to their abandonment, resulting in mortality of eggs and nestlings. These effects would be avoided and minimized with the implementation of Mitigation Measure BIO-75.

The following paragraphs summarize the combined effects discussed above and describe other BDCP conservation actions that offset or avoid these effects. NEPA and CEQA impact conclusions are also included.

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the effects of construction would not be adverse under NEPA and would be less than significant under CEQA. The Plan would remove 9,046 acres of modeled (8,092 permanent, 954 temporary) habitat for short-eared owl and northern harrier in the study area in the near-term. These effects would result from the construction of the water conveyance facilities (CM1, 2,440 acres), and implementing other conservation measures (*CM2 Yolo Bypass Fisheries Enhancement*, *CM4 Tidal Natural Communities Restoration*, *CM5 Seasonally Inundated Floodplain Restoration*, *CM8 Grassland Natural Community Restoration*, *CM9 Vernal Pool and Alkali Seasonal Wetland Complex Restoration*, *CM10 Nontidal Marsh Restoration*, and *CM18 Conservation Hatcheries*—6,606 acres).

Typical NEPA and CEQA project-level mitigation ratios for those natural communities affected by CM1 would be 1:1 for restoration/creation and 2:1 protection of habitat. Using these typical ratios would indicate that 2,440 acres of habitat should be restored and 4,880 acres should be protected to mitigate for the CM1 losses of 2,440 acres of short-eared owl and northern harrier habitat. The offsetting acreage would need to be 2,304 acres of restoration and 4,608 acres of protection (to mitigate for the 2,304 acre loss of habitat) if the east-west transmission line alignment was selected for Alternative 4. The near-term effects of other conservation actions would remove 6,606 acres of modeled habitat, and therefore require 6,606 acres of restoration and 13,212 acres of protection of short-eared owl and northern harrier habitat using the same typical NEPA and CEQA ratios (1:1 for restoration and 2:1 for protection).

The BDCP has committed to near-term goals of protecting 2,000 acres and restoring 1,140 acres of grassland natural community in CZ 1, 2, 4, 5, 7, 8, and 11. In addition, 13,800 acres of tidal natural communities and 400 acres of nontidal marsh would be restored, 14,600 acres of cultivated lands would be protected, and 35 acres of nontidal marsh would be protected. The restoration of tidal natural communities through CM4 would benefit both species by increasing the extent and value of their nesting habitat. The protection and restoration of grasslands would be part of a contiguous matrix of grassland, alkali seasonal wetland, and vernal pool natural communities which would expand habitat for short-eared owl and northern harrier and reduce the effects of current levels of habitat fragmentation. Short-eared owl and northern harrier nest in other open habitats including alfalfa, irrigated pasture, and other grain fields. Therefore some portion of the protection of 14,600 acres of cultivated lands would benefit nesting short-eared owl and northern harrier. Under *CM11 Natural Communities Enhancement and Management*, small mammal and insect prey populations would be increased on protected grassland and cultivated lands, enhancing the foraging value of these natural communities. These natural community biological goals and objectives would inform the near-term protection and restoration efforts and represent performance standards for considering the effectiveness of restoration actions for the species.

The acres of protection and restoration contained in the near-term Plan goals satisfy the typical mitigation ratios that would be applied to the project-level effects of CM1. The impacts from other near-term conservation actions would be compensated for with tidal and grassland restoration and some portion of the protection of cultivated lands, in addition to management activities initiated through *CM3* and *CM11*. In order to avoid potential adverse effects on nesting habitat for the species from near-term conservation actions, the 14,600 acres of cultivated lands would need to include sufficient acres of irrigated pasture and alfalfa to compensate for near-term impacts. Mitigation Measure BIO-121, *Near-term conservation of cultivated lands must include sufficient acres of crop types that benefit nesting short-eared owl and northern harrier*, would be available to address the potential adverse effect of habitat loss in the near-term timeframe.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training, AMM2 Construction Best Management Practices and Monitoring, AMM3 Stormwater Pollution Prevention Plan, AMM4 Erosion and Sediment Control Plan, AMM5 Spill Prevention, Containment, and Countermeasure Plan, AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan*, and *AMM7 Barge Operations Plan*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas and disposal sites. The AMMs are described in detail in BDCP Appendix 3.C. Short-eared owl and northern harrier are not covered species under the BDCP and in order to have a less than adverse effect on individuals, preconstruction surveys for noncovered avian species would be required to ensure that nests are detected and avoided. Mitigation Measure BIO-75, *Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds* would be available to address this potential adverse effect.

Late Long-Term Timeframe

Based on modeled habitat, the study area supports approximately 300,676 acres of modeled habitat for short-eared owl and northern harrier. Alternative 4 as a whole would result in the permanent loss of and temporary effects on 35,302 acres of modeled short-eared owl and northern harrier habitat during the term of the Plan (1% of the modeled habitat in the study area). The locations of these losses are described above in the analyses of individual conservation measures. The Plan includes a commitment to protect 2,000 acres and restore 1,140 acres of grassland natural community in CZs 1, 2, 4, 5, 7, 8, and 11. In addition, 13,800 acres of tidal natural communities and 400 acres of nontidal marsh would be restored, 14,600 acres of cultivated lands would be protected, and 35 acres of nontidal marsh would be protected. The restoration of tidal natural communities through CM4 would benefit both species by increasing the extent and value of their nesting habitat. The protection and restoration of grasslands would be part of a contiguous matrix of grassland, alkali seasonal wetland, and vernal pool natural communities which would expand habitat for short-eared owl and northern harrier and reduce the effects of current levels of habitat fragmentation. In addition, northern harrier would make use some croplands and pasture, and therefore some portion of the protection of 14,600 acres of cultivated lands would benefit northern harrier. Under *CM11 Natural Communities Enhancement and Management*, small mammal and insect prey populations would be increased on protected grassland and cultivated lands, enhancing the foraging value of these natural communities.

The loss of for short-eared owl and northern harrier habitat associated with Alternative 4 would represent an adverse effect as a result of habitat modification of special-status species and potential for mortality in the absence of other conservation actions. Short-eared owl and northern harrier are not covered species under the BDCP and in order to have a less than adverse effect on individuals, preconstruction surveys for noncovered avian species would be required to ensure that nests are detected and avoided. With habitat protection and restoration associated with CM3, CM8, CM9, and CM11, guided by biological goals and objectives and AMM1–AMM7, which would be in place throughout the time period any construction activity would be occurring, and the implementation of Mitigation Measure BIO-75, the effects of habitat loss and potential mortality under Alternative 4 on for short-eared owl and northern harrier would not be adverse under NEPA.

CEQA Conclusion: Alternative 4 (CM1–CM18, and CM11) would have both temporary and permanent impacts on for short-eared owl and northern harrier and their modeled habitat and operation of construction equipment could disturb individuals, if present in the study area.

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the impacts of construction would be less than significant. The Plan would remove 9,046 acres of modeled (8,092 permanent, 954 temporary) habitat for short-eared owl and northern harrier in the study area in the near-term. These impacts would result from the construction of the water conveyance facilities (CM1, 2,440 acres), and implementing other conservation measures (*CM2 Yolo Bypass Fisheries Enhancement*, *CM4 Tidal Natural Communities Restoration*, *CM5 Seasonally Inundated Floodplain Restoration*, *CM8 Grassland Natural Community Restoration*, *CM9 Vernal Pool and Alkali Seasonal Wetland Complex Restoration*, *CM10 Nontidal Marsh Restoration*, and *CM18 Conservation Hatcheries*—6,606 acres).

Typical NEPA and CEQA project-level mitigation ratios for those natural communities affected by CM1 would be 1:1 for restoration/creation and 2:1 protection of habitat. Using these typical ratios would indicate that 2,440 acres of habitat should be restored and 4,880 acres should be protected to mitigate for the CM1 losses of 2,440 acres of short-eared owl and northern harrier habitat. The offsetting acreage would need to be 2,304 acres of restoration and 4,608 acres of protection (to mitigate for the 2,304 acre loss of habitat) if the east-west transmission line alignment was selected for Alternative 4. The near-term effects of other conservation actions would remove 6,606 acres of modeled habitat, and therefore require 6,606 acres of restoration and 13,212 acres of protection of short-eared owl and northern harrier habitat using the same typical NEPA and CEQA ratios (1:1 for restoration and 2:1 for protection).

The BDCP has committed to near-term goals of protecting 2,000 acres and restoring 1,140 acres of grassland natural community in CZs 1, 2, 4, 5, 7, 8, and 11. In addition, 13,800 acres of tidal natural communities and 400 acres of nontidal marsh would be restored, 14,600 acres of cultivated lands would be protected, and 35 acres of nontidal marsh would be protected. The restoration of tidal natural communities through CM4 would benefit both species by increasing the extent and value of their nesting habitat. The protection and restoration of grasslands would be part of a contiguous matrix of grassland, alkali seasonal wetland, and vernal pool natural communities which would expand habitat for short-eared owl and northern harrier and reduce the effects of current levels of habitat fragmentation. Short-eared owl and northern harrier nest in other open habitats including alfalfa, irrigated pasture, and other grain fields. Therefore some portion of the protection of 14,600 acres of cultivated lands would benefit nesting short-eared owl and northern harrier. Under *CM11 Natural Communities Enhancement and Management*, small mammal and insect prey populations would be increased on protected grassland and cultivated lands, enhancing the foraging value of these natural communities. These natural community biological goals and objectives would inform the near-term protection and restoration efforts and represent performance standards for considering the effectiveness of restoration actions for the species.

The acres of protection and restoration contained in the near-term Plan goals satisfy the typical mitigation ratios that would be applied to the project-level effects of CM1. The impacts from other near-term conservation actions would be compensated for with tidal and grassland restoration and some portion of the protection of cultivated lands, in addition to management activities initiated through *CM3* and *CM11*. In order to avoid potential adverse effects on nesting habitat for the species from near-term conservation actions, the 14,600 acres of cultivated lands would need to include sufficient acres of irrigated pasture and alfalfa to compensate for near-term impacts. Mitigation Measure BIO-121, *Near-term conservation of cultivated lands must include sufficient acres of crop types that benefit nesting short-eared owl and northern harrier*, would reduce the potential significant impact of habitat loss in the near-term timeframe.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training, AMM2 Construction Best Management Practices and Monitoring, AMM3 Stormwater Pollution Prevention Plan, AMM4 Erosion and Sediment Control Plan, AMM5 Spill Prevention, Containment, and Countermeasure Plan, AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan, and AMM7 Barge Operations Plan*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas and disposal sites. The AMMs are described in detail in BDCP Appendix 3.C. Short-eared owl and northern harrier are not covered species under the BDCP and in order to have a less-than-significant impact on individuals, preconstruction surveys for noncovered avian species would be required to ensure that nests are detected and avoided. The implementation of Mitigation Measure BIO-75, *Conduct preconstruction nesting bird surveys and* *avoid disturbance of nesting birds,* would reduce potential adverse effects on nesting short-eared owl and northern harrier to a less-than-significant level.

Late Long-Term Timeframe

Based on modeled habitat, the study area supports approximately 300,676 acres of modeled habitat for short-eared owl and northern harrier. Alternative 4 as a whole would result in the permanent loss of and temporary effects on 35,302 acres of modeled short-eared owl and northern harrier habitat during the term of the Plan (1% of the modeled habitat in the study area). The locations of these losses are described above in the analyses of individual conservation measures. The Plan includes a commitment to protect 2,000 acres and restore 1,140 acres of grassland natural community in CZs 1, 2, 4, 5, 7, 8, and 11. In addition, 13,800 acres of tidal natural communities and 400 acres of nontidal marsh would be restored, 14,600 acres of cultivated lands would be protected, and 35 acres of nontidal marsh would be protected. The restoration of tidal natural communities through CM4 would benefit both species by increasing the extent and value of their nesting habitat. The protection and restoration of grasslands would be part of a contiguous matrix of grassland, alkali seasonal wetland, and vernal pool natural communities which would expand habitat for short-eared owl and northern harrier and reduce the effects of current levels of habitat fragmentation. In addition, northern harrier would make use some croplands and pasture, and therefore some portion of the protection of 14,600 acres of cultivated lands would benefit northern harrier. Under *CM11 Natural Communities Enhancement and Management*, small mammal and insect prey populations would be increased on protected grassland and cultivated lands, enhancing the foraging value of these natural communities. Short-eared owl and northern harrier are not covered species under the BDCP and in order to have a less-than-significant impact on individuals, preconstruction surveys for noncovered avian species would be required to ensure that nests are detected and avoided. Mitigation Measure BIO-75 would reduce the potential impact on nesting short-eared owl and northern harrier to a less-than-significant impact.

Considering these protection and restoration provisions, which would provide acreages of new high-value or enhanced habitat in amounts suitable to compensate for habitats lost to construction and restoration activities, and with the implementation of AMM1–AMM7, and Mitigation Measure BIO-75, the loss of habitat or direct mortality through implementation of Alternative 4 would not result in a substantial adverse effect through habitat modifications and would not substantially reduce the number or restrict the range of either species. Therefore, the loss of habitat or potential mortality under this alternative would have a less-than-significant impact on short-eared owl and northern harrier.

Mitigation Measure BIO-75: Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds

See Mitigation Measure BIO-75 under Impact BIO-75.

Mitigation Measure BIO-121: Near-term conservation of cultivated lands must include sufficient acres of crop types that benefit nesting short-eared owl and northern harrier

Of the 14,600 acres of cultivated lands protected in the near-term, sufficient acres must be managed in alfalfa and irrigated pasture, such that the total acres of habitat impacted in the near-term are compensated at a ratio of 1:1 restoration and 2:1 protection.

Impact BIO-122: Effects on short-eared owl and northern harrier associated with electrical transmission facilities

New transmission lines would increase the risk for bird-power line strikes, which could result in injury or mortality of short-eared owl and northern harrier. *AMM20 Greater Sandhill Crane,* would minimize the risk of bird strikes. Thus, there would be no adverse effect.

CEQA Conclusion: New transmission lines would increase the risk for bird-power line strikes, which could result in injury or mortality of short-eared owl and northern harrier. With the incorporation of *AMM20 Greater Sandhill Crane*, new transmission lines would have a less-than-significant impact on short-eared owl and northern harrier.

Impact BIO-123: Indirect effects of plan implementation on short-eared owl and northern harrier

Indirect construction-related effects: Noise and visual disturbances associated with construction-related activities could result in temporary disturbances that affect short-eared owl and northern harrier use of modeled habitat. Indirect effects associated with construction include noise, dust, and visual disturbance caused by grading, filling, contouring, and other ground-disturbing operations. Construction-related noise and visual disturbances could disrupt nesting and foraging behaviors, and reduce the functions of suitable habitat which could result in an adverse effect on these species. Mitigation Measure BIO-75, *Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds*, would be available to minimize potential adverse effects to active nests. The use of mechanical equipment during water conveyance construction could cause the accidental release of petroleum or other contaminants that could affect these species or their prey in the surrounding habitat. AMM1–AMM7, including *AMM2 Construction Best Management Practices and Monitoring*, would minimize the likelihood of such spills from occurring. The inadvertent discharge of sediment or excessive dust adjacent to short-eared owl and northern harrier could also have a negative effect on these species. AMM1–AMM7 would ensure that measures are in place to prevent runoff from the construction area and the negative effects of dust on wildlife adjacent to work areas.

Methylmercury Exposure: Covered activities have the potential to exacerbate bioaccumulation of mercury in avian species, including short-eared owl and northern harrier. Marsh (tidal and nontidal) and floodplain restoration have the potential to increase exposure to methylmercury. Mercury is transformed into the more bioavailable form of methylmercury in aquatic systems, especially areas subjected to regular wetting and drying such as tidal marshes and flood plains (Alpers et al. 2008). Thus, BDCP restoration activities that create newly inundated areas could increase bioavailability of mercury (see BDCP Chapter 3, *Conservation Strategy*, for details of restoration). Species sensitivity to methylmercury differs widely and there is a large amount of uncertainty with respect to species-specific effects. Increased methylmercury associated with natural community and floodplain restoration could indirectly affect short-eared owl and northern harrier, via uptake in lower tropic levels (as described in the BDCP, Appendix 5.D, *Contaminants*).

In addition, the potential mobilization or creation of methylmercury within the Plan Area varies with site-specific conditions and would need to be assessed at the project level. Measures described in Chapter 3 of the BDCP, Section 3.4.13, *CM12 Methylmercury Management* include provisions for Project-specific Mercury Management Plans. Site-specific restoration plans that address the creation and mobilization of mercury, as well as monitoring and adaptive management as described in CM12 would be available to address the uncertainty of methylmercury levels in restored tidal marsh and potential impacts on short-eared owl and northern harrier.

CEQA Conclusion: Impacts of noise, the potential for hazardous spills, increased dust and sedimentation, and operations and maintenance of the water conveyance facilities would be less than significant with the implementation of Mitigation Measure BIO-75, *Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds*, and AMM1–AMM7. The implementation of tidal natural communities restoration or floodplain restoration could result in increased exposure of short-eared owl and northern harrier to methylmercury, through the ingestion of fish or small mammals in tidally restored areas. However, it is unknown what concentrations of methylmercury are harmful to these species. Site-specific restoration plans that address the creation and mobilization of mercury, as well as monitoring and adaptive management as described in CM12 would better inform potential impacts and address the uncertainty of methylmercury levels in restored tidal marsh in the study area.

Mitigation Measure BIO-75: Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds

See Mitigation Measure BIO-75 under Impact BIO-75.

Impact BIO-124: Periodic effects of inundation on short-eared owl and northern harrier as a result of implementation of conservation components

Flooding of the Yolo Bypass from Fremont Weir operations (*CM2 Yolo Bypass Fisheries Enhancement*) would increase the frequency and duration of inundation on approximately 946–2,445 acres of modeled short-eared owl and northern harrier habitat (Table 12-4-45).

Based on hypothetical footprints, implementation of *CM5 Seasonally Inundated Floodplain Restoration* could result in the periodic inundation of up to approximately 2,878 acres of modeled habitat (Table 12-4-45), the majority of which would be pasture and other cultivated lands.

Reduced foraging habitat availability may be expected during the fledgling period of the nesting season due to periodic inundation. However, inundation would occur during the non-breeding season and would not be expected to have an adverse effect on either species.

CEQA Conclusion: Periodic inundation of floodplains would not have a significant impact on short-eared owl and northern harrier because inundation is expected to occur prior to the breeding season.

Redhead

Impacts, relevant protection and restoration actions, and mitigation requirements under CEQA are discussed in the *General Terrestrial Biology Effects* section under Impact BIO-180, *Loss or conversion of habitat for breeding waterfowl*. Further details of the methods of analysis for waterfowl and shorebirds can be found in the *BDCP Waterfowl and Shorebird Effects Analysis* (Ducks Unlimited 2012).

Mountain Plover

This section describes the effects of Alternative 4, including water conveyance facilities construction and implementation of other conservation components, on mountain plover. Modeled habitat for mountain plover include grassland, alfalfa, other cultivated crops, and alkali seasonal wetland.

Construction and restoration associated with Alternative 4 conservation measures would result in both temporary and permanent losses of modeled habitat for mountain plover as indicated in Table 12-4-46. Full implementation of Alternative 4 would restore or create 2,000 acres of grassland natural community and 72 acres of alkali seasonal wetland. In addition, 8,000 acres of grassland, 150 acres of alkali seasonal wetland, and 45,405 of cultivated lands would be protected (Table 12-4-46). As explained below, with the restoration or protection of these amounts of habitat, impacts on mountain plover would not be adverse for NEPA purposes and would be less than significant for CEQA purposes.

Table 12-4-46. Changes in Mountain Plover Modeled Habitat Associated with Alternative 4 (acres)[a]

	Conservation Measure[b]	Habitat Type	Permanent		Temporary		Periodic[d]	
			NT	LLT	NT	LLT	Yolo	Floodplain
Habitat Affected[c]	CM1		2,775	2,775	981	981	NA	NA
	Total Impacts CM1		**2,775**	**2,775**	**981**	**981**		
	CM2–CM18		3,377	33,030	165	1,056	1,884–3,813	7,082
	Total Impacts CM2–CM18		**3,377**	**33,030**	**165**	**1,056**	**1,884–3,813**	**7,082**
	TOTAL IMPACTS		**6,152**	**35,805**	**1,146**	**2,037**	**1,884–3,813**	**7,082**
Habitat Restored/ Created[e]	CM8 grassland		1,140	2,000	NA	NA	NA	NA
	CM3 alkali seasonal wetland		48	72	NA	NA	NA	NA
	Total Restoration/Creation		**1,188**	**2,072**				
Habitat Protected[e]	CM3 grassland		2,000	8,000	NA	NA	NA	NA
	CM3 alkali seasonal wetland		120	150	NA	NA	NA	NA
	CM3 cultivated lands (non-rice)		14,600	45,405	NA	NA	NA	NA
	Total Protection		**16,720**	**53,555**				

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late long-term timeframes.

[b] See discussion below for a description of applicable CMs.

[c] LLT acreages are a summation of effects that would occur in the near-term, early long-term and late long-term timeframes. The LLT acreages represent the total amount of habitat that would be affected over the 50-year life of the BDCP and do not reflect habitat increases that would result from restoration, creation and protection activities.

[d] Periodic effects were estimated for the late long-term only. Yolo periodic impacts are presented as a range based on different flow regimes at the proposed notch in Fremont Weir.

[e] Restored/created and protected habitat acreages represent planned conservation activities that would be implemented over the lifetime of the BDCP (see BDCP Chapter 3, *Conservation Strategy*, for specifics).

NT = near-term
LLT = late long-term
NA = not applicable

Impact BIO-125: Loss or conversion of habitat for and direct mortality of mountain plover

Alternative 4 conservation measures would result in the combined permanent and temporary loss of up to 37,842 acres of modeled habitat for mountain plover (35,805 acres of permanent loss and

2,037 of temporary loss, Table 12-4-46). Conservation measures that would result in these losses are conveyance facilities and transmission line construction, and establishment and use of borrow and spoil areas (CM1), Yolo Bypass improvements (CM2), tidal habitat restoration (CM4), floodplain restoration (CM5), grassland restoration (CM8), nontidal marsh restoration (CM10), and construction of conservation hatcheries (CM18). The majority of habitat loss would result from CM4. Habitat enhancement and management activities (CM11), which include ground disturbance or removal of nonnative vegetation, could result in local adverse habitat effects. In addition, maintenance activities associated with the long-term operation of the water conveyance facilities and other BDCP physical facilities could degrade or eliminate mountain plover foraging habitat. Each of these individual activities is described below. A summary statement of the combined impacts and NEPA and CEQA conclusions follows the individual conservation measure discussions.

- *CM1 Water Facilities and Operation:* Construction of Alternative 4 conveyance facilities would result in the combined permanent and temporary loss of up to 3,676 acres of modeled mountain plover habitat (2,775 acres of permanent loss, 981 acres of temporary loss) from CZs 3–6 and CZ 8. The majority of habitat removed would be cultivated lands and grassland that would be removed from CZ 8, from the construction of the Byron Forebay. Refer to the Terrestrial Biology Map Book for a detailed view of Alternative 4 construction locations.

  There would be an 25 acre decrease in the combined permanent and temporary loss of mountain plover habitat associated with the construction of the east-west transmission line for the Alternative 4 water conveyance facility rather than the north-south transmission line.

- *CM2 Yolo Bypass Fisheries Enhancement:* Construction of the Yolo bypass fisheries enhancement (CM2) would permanently remove 382 acres of modeled mountain plover habitat in the Yolo Bypass in CZ 2. In addition, 165 acres of grassland habitat would be temporarily removed.

- *CM4 Tidal Natural Communities Restoration:* Tidal habitat restoration (CM4) site preparation and inundation would permanently remove an estimated 26,175 acres of modeled mountain plover habitat in CZ 1, 2, 4, 5, 6, 7, 8, 10, and 11. The majority of loss would be of cultivated lands. However, tidal restoration would also directly impact and fragment remaining grassland habitat just north of Rio Vista in and around French and Prospect Islands, and in an area south of Rio Vista around Threemile Slough.

- *CM5 Seasonally Inundated Floodplain Restoration:* Construction of setback levees to restore seasonally inundated floodplain (CM5) would permanently and temporarily remove approximately 5,687 acres (4,796 permanent, 891 temporary) of modeled mountain plover in CZ 2, 4, and 7.

- *CM8 Grassland Natural Community Restoration and CM9 Vernal Pool and Alkali Seasonal Wetland Complex Restoration:* Grassland restoration would primarily be implemented on agricultural lands and would result in the permanent loss of 1,142 acres of modeled mountain plover habitat. Temporary construction-related disturbance of grassland habitat would result from implementation of *CM8* and *CM9* in CZs 1, 8, and 11. However, all areas would be restored to their original or higher value habitat after the construction periods. The resulting restoration of 2,000 acres of grassland would benefit mountain plover with the restoration of potential foraging habitat.

- *CM10 Nontidal Marsh Restoration:* Implementation of *CM10 Nontidal Marsh Restoration* would result in the permanent removal of 500 acres of mountain plover habitat.

- *CM11 Natural Communities Enhancement and Management:* A variety of habitat management actions included in *CM11 Natural Communities Enhancement and Management* that are designed to enhance wildlife values in restored or protected habitats could result in localized ground disturbances that could temporarily remove small amounts of mountain plover habitat. Ground-disturbing activities, such as removal of nonnative vegetation and road and other infrastructure maintenance activities, would be expected to have minor adverse effects on available mountain plover habitat.
- *CM18 Conservation Hatcheries:* Implementation of CM18 would remove up to 35 acres of mountain plover grassland habitat.
- Operations and Maintenance: Postconstruction operation and maintenance of the above-ground water conveyance facilities and restoration infrastructure could result in ongoing but periodic disturbances that could affect mountain plover use of the surrounding habitat. Maintenance activities would include vegetation management, levee and structure repair, and re-grading of roads and permanent work areas. These effects, however, would be reduced by AMMs and conservation actions as described below.
- Injury and Direct Mortality: Construction would not be expected to result in direct mortality of mountain plover because foraging individuals would be expected to temporarily avoid the increased noise and activity associated with construction areas.

The following paragraphs summarize the combined effects discussed above and describe other BDCP conservation actions that offset or avoid these effects. NEPA and CEQA impact conclusions are also included.

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the effects of construction would not be adverse under NEPA and would be less than significant under CEQA. The Plan would remove 7,298 acres of modeled (6,152 acres of permanent loss, and 1,146 acres of temporary loss) habitat for mountain plover in the study area in the near-term. These effects would result from the construction of the water conveyance facilities (CM1, 3,756 acres), and implementing other conservation measures (*CM2 Yolo Bypass Fisheries Enhancement*, *CM4 Tidal Natural Communities Restoration*, *CM5 Seasonally Inundated Floodplain Restoration*, *CM8 Grassland Natural Community Restoration*, *CM9 Vernal Pool and Alkali Seasonal Wetland Complex Restoration*, *CM10 Nontidal Marsh Restoration*, and *CM18 Conservation Hatcheries*—3,542 acres).

Typical NEPA and CEQA project-level mitigation ratios for those natural communities affected by CM1 would be 2:1 for protection of mountain plover wintering habitat. Using this typical ratio would indicate that 7,512 acres of habitat should be protected to mitigate for the CM1 losses of 3,756 acres of mountain plover habitat. The offsetting acreage would need to be 7,302 acres of protection if the east-west transmission line alignment was selected for Alternative 4. The near-term effects of other conservation actions would remove 3,542 acres of modeled habitat, and therefore require 7,084 acres of protection of mountain plover habitat using the same typical NEPA and CEQA ratios (2:1 for protection).

The BDCP has committed to near-term goals of protecting 2,000 acres and restoring 1,140 acres of high-value grassland natural community in CZs 1, 2, 4, 5, 7, 8, and 11; protecting 120 acres and restoring 58 acres of alkali seasonal wetland in CZs 1, 8, and/or 11; and protecting 14,600 acres of cultivated lands (excluding rice-lands). The protection and restoration of grasslands, alkali seasonal wetland and vernal pool natural communities would be protected as a contiguous mosaic of these natural communities which would provide wintering habitat for mountain plover and reduce the effects of current levels of habitat fragmentation. Some portion of the protected cultivated lands would also benefit mountain plover. Biological goals and objectives for Swainson's hawk further specify that within the 45,505 acres of cultivated lands conserved by the late long-term, at least 36,725 acres would be managed as Swainson's hawk habitat, with at least 50% of that in alfalfa production in CZs 1, 2, 3, 4, 7, 8, 9, and 11. This minimum commitment of crop management would also provide suitable foraging habitat for wintering mountain plover in the Plan Area.

These natural community biological goals and objectives would inform the near-term protection and restoration efforts and represent performance standards for considering the effectiveness of restoration actions for the species. The acres of protection and restoration contained in the near-term Plan goals would satisfy the typical mitigation ratios that would be applied to the project-level effects of CM1, in addition to habitat loss from other near-term impacts.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training, AMM2 Construction Best Management Practices and Monitoring, AMM3 Stormwater Pollution Prevention Plan, AMM4 Erosion and Sediment Control Plan, AMM5 Spill Prevention, Containment, and Countermeasure Plan, AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan*, and *AMM7 Barge Operations Plan*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas and disposal sites. The AMMs are described in detail in BDCP Appendix 3.C.

Late Long-Term Timeframe

Based on modeled habitat, the study area supports approximately 353,219 acres of potential habitat for mountain plover. Alternative 4 as a whole would result in the permanent loss of and temporary effects on 37,842 acres of mountain plover habitat during the term of the Plan (11% of the total habitat in the study area). The locations of these losses are described above in the analyses of individual conservation measures. The Plan includes a commitment to restore or create at least 2,079 acres of grassland and alkali seasonal wetland in CZs 1, 8, and 11 and to protect 53,555 acres of grassland, alkali seasonal wetland and cultivated lands in the study area. 8,150 acres would consist of a mosaic of grasslands, and alkali seasonal wetlands. Biological goals and objectives for Swainson's hawk further specify that within the 45,505 acres of cultivated lands conserved by the late long-term, at least 36,725 acres would be managed as Swainson's hawk habitat, with at least 50% of that in alfalfa production in CZs 1, 2, 3, 4, 7, 8, 9, and 11. This minimum commitment of crop management would also provide suitable foraging habitat for wintering mountain plover in the Plan Area.

The loss of mountain plover habitat associated with Alternative 4 would represent an adverse effect as a result of habitat modification of a special-status species and potential for direct mortality in the absence of other conservation actions. However, with habitat protection and restoration associated with CM3, CM8, and CM11, guided by biological goals and objectives and AMM1–AMM7, which would be in place throughout the time period any construction activity would be occurring, the effects of habitat loss and potential mortality under Alternative 4 on mountain plover would not be adverse under NEPA.

CEQA Conclusion: Alternative 4 (CM1–CM18) would have both temporary and permanent impacts on mountain plover and their modeled habitat and operation of construction equipment could injure or disturb individuals, if present in the study area.

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the impacts of construction would be less than significant. The Plan would remove 7,298 acres of modeled (6,152 acres of permanent loss, and 1,146 acres of temporary loss) habitat for mountain plover in the study area in the near-term. These impacts would result from the construction of the water conveyance facilities (CM1, 3,756 acres), and implementing other conservation measures (*CM2 Yolo Bypass Fisheries Enhancement*, *CM4 Tidal Natural Communities Restoration*, *CM5 Seasonally Inundated Floodplain Restoration*, *CM8 Grassland Natural Community Restoration*, *CM9 Vernal Pool and Alkali Seasonal Wetland Complex Restoration*, *CM10 Nontidal Marsh Restoration*, and *CM18 Conservation Hatcheries*—3,542 acres).

Typical NEPA and CEQA project-level mitigation ratios for those natural communities affected by CM1 would be 2:1 for protection of mountain plover wintering habitat. Using this typical ratio would indicate that 7,512 acres of habitat should be protected to mitigate for the CM1 losses of 3,756 acres of mountain plover habitat. The offsetting acreage would need to be 7,302 acres of protection if the east-west transmission line alignment was selected for Alternative 4. The near-term effects of other conservation actions would remove 3,542 acres of modeled habitat, and therefore require 7,084 acres of protection of mountain plover habitat using the same typical NEPA and CEQA ratios (2:1 for protection).

The BDCP has committed to near-term goals of protecting 2,000 acres and restoring 1,140 acres of high-value grassland natural community in CZs 1, 2, 4, 5, 7, 8, and 11; protecting 120 acres and restoring 58 acres of alkali seasonal wetland in CZs 1, 8, and/or 11; and protecting 14,600 acres of cultivated lands (excluding rice-lands). The protection and restoration of grasslands, alkali seasonal wetland and vernal pool natural communities would be protected as a contiguous mosaic of these natural communities which would provide wintering habitat for mountain plover and reduce the effects of current levels of habitat fragmentation. Some portion of the protected cultivated lands would also benefit mountain plover. Biological goals and objectives for Swainson's hawk further specify that within the 45,505 acres of cultivated lands conserved by the late long-term, at least 36,725 acres would be managed as Swainson's hawk habitat, with at least 50% of that in alfalfa production in CZs 1, 2, 3, 4, 7, 8, 9, and 11. This minimum commitment of crop management would also provide suitable foraging habitat for wintering mountain plover in the Plan Area.

These natural community biological goals and objectives would inform the near-term protection and restoration efforts and represent performance standards for considering the effectiveness of restoration actions for the species. The acres of protection and restoration contained in the near-term Plan goals would satisfy the typical mitigation ratios that would be applied to the project-level effects of CM1, in addition to habitat loss from other near-term impacts. The Plan also includes commitments to implement *AMM1 Worker Awareness Training, AMM2 Construction Best Management Practices and Monitoring, AMM3 Stormwater Pollution Prevention Plan, AMM4 Erosion and Sediment Control Plan, AMM5 Spill Prevention, Containment, and Countermeasure Plan, AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan*, and *AMM7 Barge Operations Plan*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas and disposal sites. The AMMs are described in detail in BDCP Appendix 3.C.

Late Long-Term Timeframe

Based on modeled habitat, the study area supports approximately 353,219 acres of potential habitat for mountain plover. Alternative 4 as a whole would result in the permanent loss of and temporary effects on 37,842 acres of mountain plover habitat during the term of the Plan (11% of the total habitat in the study area). The locations of these losses are described above in the analyses of individual conservation measures. The Plan includes a commitment to restore or create at least 2,079 acres of grassland and alkali seasonal wetland in CZ 1, 8, and 11 and to protect 53,555 acres of grassland, alkali seasonal wetland and cultivated lands in the study area. 8,150 acres would consist of a mosaic of grasslands, and alkali seasonal wetlands. Biological goals and objectives for Swainson's hawk further specify that within the 45,505 acres of cultivated lands conserved by the late long-term, at least 36,725 acres would be managed as Swainson's hawk habitat, with at least 50% of that in alfalfa production in CZs 1, 2, 3, 4, 7, 8, 9, and 11. This minimum commitment of crop management would also provide suitable foraging habitat for wintering mountain plover in the Plan Area.

Considering these protection and restoration provisions, which would provide acreages of new high-value or enhanced habitat in amounts suitable to compensate for habitats lost to construction and restoration activities, and implementation of AMM1–AMM7, the loss of habitat or direct mortality through implementation of Alternative 4 would not result in a substantial adverse effect through habitat modifications and would not substantially reduce the number or restrict the range of the species. Therefore, the loss of habitat or potential mortality under this alternative would have a less-than-significant impact on mountain plover.

Impact BIO-126: Effects on mountain plover associated with electrical transmission facilities

New transmission lines would increase the risk for bird-power line strikes, which could result in injury or mortality of mountain plover. However, mountain plover mortality from powerline strikes is unlikely due to the species' flight patterns. The risk for bird-power line strikes, is therefore not expected to have an adverse effect on mountain plover.

CEQA Conclusion: New transmission lines are not expected to have a significant impact on mountain plover because of the species' flight patterns.

Impact BIO-127: Indirect effects of operations and maintenance of water conveyance facilities on mountain plover

Construction- and subsequent maintenance-related noise and visual disturbances could disrupt foraging, and reduce the functions of suitable foraging habitat for mountain plover. Indirect effects associated with construction include noise, dust, and visual disturbance caused by grading, filling, contouring, and other ground-disturbing operations. The use of mechanical equipment during water conveyance facilities construction could cause the accidental release of petroleum or other contaminants that could affect these species or their prey in the surrounding habitat. AMM1–AMM7, including *AMM2 Construction Best Management Practices and Monitoring*, would minimize the likelihood of such spills from occurring. The inadvertent discharge of sediment or excessive dust adjacent to mountain plover grassland habitat could also have a negative effect on the species.

However, AMM1–AMM7 would also ensure that measures would be in place to prevent runoff from the construction area and the negative effects of dust on wildlife adjacent to work areas.

CEQA Conclusion: With the incorporation of AMM1–AMM7 into the BDCP, indirect effects as a result of constructing the water conveyance facilities would have a less-than-significant impact on mountain plover.

Impact BIO-128: Periodic effects of inundation on mountain plover as a result of implementation of conservation components

Flooding of the Yolo Bypass from Fremont Weir operations (*CM2 Yolo Bypass Fisheries Enhancement*) would increase the frequency and duration of inundation on approximately 1,884-3,813 acres of modeled mountain plover foraging habitat (Table 12-4-46).

Based on hypothetical footprints, implementation of *CM5 Seasonally Inundated Floodplain Restoration*, could result in the periodic inundation of up to approximately 7,082 acres of modeled habitat (Table 12-4-46). Periodic inundation from CM2 and CM5 would not have an adverse effect on mountain plover because birds would be expected to move to adjacent foraging habitat.

CEQA Conclusion: Implementation of CM2 and CM5 would periodically inundate suitable mountain plover foraging habitat. However, effects of periodic inundation would have a less-than-significant impact on mountain plover because birds would be expected to move to adjacent foraging habitat.

Black Tern

This section describes the effects of Alternative 4, including water conveyance facilities construction and implementation of other conservation components, on black tern. Modeled breeding habitat for black tern includes rice in CZ 2.

Construction and restoration associated with Alternative 4 conservation measures would not result in any temporary or permanent loss of modeled habitat for black tern as indicated in Table 12-4-47. However, inundation of the Yolo Bypass, would increase the duration of inundation of 439-585 acres of rice in CZ 2, some of which may be potential breeding habitat for the species (Table 12-4-47). As explained below, impacts on black tern would not be adverse for NEPA purposes and would be less than significant for CEQA purposes.

Table 12-4-47. Changes in Black Tern Modeled Habitat Associated with Alternative 4 (acres)[a]

	Conservation Measure[b]	Habitat Type	Permanent		Temporary		Periodic[d]	
			NT	LLT	NT	LLT	Yolo	Floodplain
Habitat Affected[c]	CM1	Breeding	0	0	0	0	NA	NA
	Total Impacts CM1		**0**	**0**	**0**	**0**		
	CM2–CM18	Breeding	0	0	0	0	439–585	0
	Total Impacts CM2–CM18		**0**	**0**	**0**	**0**	**439–585**	**0**
	TOTAL IMPACTS		**0**	**0**	**0**	**0**	**439–585**	**0**
Habitat Restored/ Created[e]	**Total Restoration/Creation**		**0**	**0**	NA	NA	NA	NA
Habitat Protected[e]	**Total Protection**		**0**	**0**	NA	NA	NA	NA

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late long-term timeframes.

[b] See discussion below for a description of applicable CMs.

[c] LLT acreages are a summation of effects that would occur in the near-term, early long-term and late long-term timeframes. The LLT acreages represent the total amount of habitat that would be affected over the 50-year life of the BDCP and do not reflect habitat increases that would result from restoration, creation and protection activities.

[d] Periodic effects were estimated for the late long-term only. Yolo periodic impacts are presented as a range based on different flow regimes at the proposed notch in Fremont Weir.

[e] Restored/created and protected habitat acreages represent planned conservation activities that would be implemented over the lifetime of the BDCP (see BDCP Chapter 3, *Conservation Strategy*, for specifics).

NT = near-term

LLT = late long-term

NA = not applicable

Impact BIO-129: Periodic effects of inundation on black tern nesting habitat as a result of construction of conservation components

Flooding of the Yolo Bypass would inundate 439–585 acres of suitable black tern nesting habitat (land currently managed as rice in CZ 2). Inundation would occur during the non-breeding season but may reduce the availability of nesting habitat during years that flooding extends into the nesting season (past March). Extended inundation of the Yolo Bypass would not be expected to affect black tern nesting habitat. However, if periodic inundation took land out of rice production, this could have an adverse effect on black tern nesting habitat. If inundation hindered the ability to plant rice, the conservation strategy for giant garter snake would require that up to 4,600 acres of rice fields would be created in CZ 2, which would also create potential nesting habitat for black tern.

CEQA Conclusion: Flooding of the Yolo Bypass is not expected to have a significant impact on nesting habitat for black tern. However, if flooding were to significantly reduce rice production (and reduce suitable black tern nesting habitat) this impact would be reduced to less than significant by the creation of 4,600 acres of rice in CZ 2 under the Biological Goals and Objectives for giant garter snake GGS1.1 in the BDCP.

California Horned Lark and Grasshopper Sparrow

The primary impact of concern for grasshopper sparrow and California horned lark would be the loss of breeding habitat in the Plan Area, which includes open grassland, irrigated pasture, and alkali seasonal wetland complex communities. Construction and restoration associated with Alternative 4 conservation measures would result in both temporary and permanent losses of modeled breeding habitat for California horned lark and grasshopper sparrow as indicated in Table 12-4-48. Full implementation of Alternative 4 would restore or create 2,000 acres of grassland natural community and 72 acres of alkali seasonal wetland natural communities. In addition, 8,000 acres of grassland and 150 acres of alkali seasonal wetland natural communities would be protected (Table 12-4-48). A portion of the protection and management of 45,405 acres of cultivated lands would benefit California horned lark and grasshopper sparrow, to the extent that some acreage was managed as irrigated pasture. As explained below, with the restoration or protection of these amounts of habitat, impacts on California horned lark and grasshopper sparrow would not be adverse for NEPA purposes and would be less than significant for CEQA purposes.

Table 12-4-48. Changes in California Horned Lark and Grasshopper Sparrow Modeled Habitat Associated with Alternative 4 (acres)[a]

	Conservation Measure[b]	Habitat Type	Permanent		Temporary		Periodic[d]	
			NT	LLT	NT	LLT	Yolo	Floodplain
Habitat Affected[c]	CM1	Breeding	324	324	285	285	NA	NA
	Total Impacts CM1		**324**	**324**	**285**	**285**		
	CM2–CM18	Breeding	3,107	7,411	165	207	777–2,423	656
	Total Impacts CM2–CM18		**3,107**	**7,411**	**165**	**207**	**777–2,423**	**656**
	TOTAL IMPACTS		**3,431**	**7,735**	**450**	**537**	**777–2,423**	**656**
Habitat Restored/ Created[e]	CM8 grassland		1,140	2,000	NA	NA	NA	NA
	CM3 alkali seasonal wetland		58	72				
	Total Restoration/Creation		**1,198**	**2,072**				
Habitat Protected[e]	CM3 grassland		2,000	8,000	NA	NA	NA	NA
	CM3 alkali seasonal wetland		120	150				
	CM3 cultivated lands (non-rice)		14,600	45,405				
	Total Protection		**16,720**	**53,555**				

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late long-term timeframes.

[b] See discussion below for a description of applicable CMs.

[c] LLT acreages are a summation of effects that would occur in the near-term, early long-term and late long-term timeframes. The LLT acreages represent the total amount of habitat that would be affected over the 50-year life of the BDCP and do not reflect habitat increases that would result from restoration, creation and protection activities.

[d] Periodic effects were estimated for the late long-term only. Yolo periodic impacts are presented as a range based on different flow regimes at the proposed notch in Fremont Weir.

[e] Restored/created and protected habitat acreages represent planned conservation activities that would be implemented over the lifetime of the BDCP (see BDCP Chapter 3, *Conservation Strategy*, for specifics).

NT = near-term

LLT = late long-term

NA = not applicable

Impact BIO-130: Loss or conversion of habitat for and direct mortality of grasshopper sparrow and California horned lark

Alternative 4 conservation measures would result in the combined permanent and temporary loss of up to 8,272 acres of modeled breeding habitat for California horned lark and grasshopper sparrow (of which 7,735 acres would be a permanent loss and 537 acres would be a temporary loss of habitat, Table 12-4-48). Conservation measures that would result in these losses are conveyance facilities and transmission line construction, and establishment and use of borrow and spoil areas (CM1), Yolo Bypass fisheries improvements (CM2), tidal habitat restoration (CM4), floodplain restoration (CM5), grassland restoration (CM8), vernal pool and wetland restoration (CM9), and construction of conservation hatcheries (CM18). The majority of habitat loss would result from CM4. Habitat enhancement and management activities (CM11), which include ground disturbance or removal of nonnative vegetation, could result in local adverse habitat effects. In addition, maintenance activities associated with the long-term operation of the water conveyance facilities and other BDCP physical facilities could degrade or eliminate California horned lark and grasshopper sparrow modeled habitat. Each of these individual activities is described below. A summary statement of the combined impacts and NEPA and CEQA conclusions follows the individual conservation measure discussions.

- *CM1 Water Facilities and Operation:* Construction of Alternative 4 conveyance facilities would result in the combined permanent and temporary loss of up to 609 acres of modeled California horned lark and grasshopper sparrow habitat (324 acres of permanent loss, 285 acres of temporary loss) from CZs 3-6 and CZ 8. The majority of grassland that would be removed would be in CZ 8, from the construction of the Byron Forebay. Refer to the Terrestrial Biology Map Book for a detailed view of Alternative 4 construction locations.

  There would be an 18 acre decrease in the combined permanent and temporary loss of horned lark and grasshopper sparrow habitat associated with the construction of the east-west transmission line for the Alternative 4 water conveyance facilities rather than the north-south transmission line.

- *CM2 Yolo Bypass Fisheries Enhancement:* Construction of the Yolo bypass fisheries enhancement (CM2) would permanently remove 374 acres of low-value modeled California horned lark and grasshopper sparrow habitat in the Yolo Bypass in CZ 2. In addition, 165 acres of habitat would be temporarily removed. Most of the grassland losses would occur at the north end of the bypass below Fremont Weir, along the Toe Drain/Tule Canal, and along the west side channels. Realignment of Putah Creek could involve excavation and grading in alkali seasonal wetland complex habitat as a new channel is constructed.

- *CM4 Tidal Natural Communities Restoration:* Tidal habitat restoration (CM4) site preparation and inundation would permanently remove an estimated 6,400 acres of modeled California horned lark and grasshopper sparrow habitat. The majority of the grassland losses would likely occur in the vicinity of Cache Slough, on Decker Island in the West Delta ROA, on the upslope fringes of Suisun Marsh, and along narrow bands adjacent to waterways in the South Delta ROA. Tidal restoration would directly impact and fragment grassland just north of Rio Vista in and around French and Prospect Islands, and in an area south of Rio Vista around Threemile Slough. Losses of alkali seasonal wetland complex habitat would likely occur in the south end of the Yolo Bypass and on the northern fringes of Suisun Marsh.

- *CM5 Seasonally Inundated Floodplain Restoration:* Construction of setback levees to restore seasonally inundated floodplain (CM5) would permanently and temporarily remove approximately 618 acres of modeled California horned lark and grasshopper sparrow habitat (576 permanent, 42 temporary). These losses would be expected to occur along the San Joaquin River and other major waterways in CZ 7.

- *CM8 Grassland Natural Community Restoration* and *CM9 Vernal Pool and Alkali Seasonal Wetland Complex Restoration:* Temporary construction-related disturbance of grassland habitat would result from implementation of *CM8* and *CM9* in CZs 1, 8, and 11. However, all areas would be restored to their original or higher value habitat after the construction periods. The resulting restoration of 2,000 acres of grassland, and 72 acres of alkali seasonal wetland would benefit California horned lark and grasshopper sparrow.

- *CM11 Natural Communities Enhancement and Management:* The protection of 8,000 acres of grassland and 150 acres of alkali seasonal wetland complex for covered species is also expected to benefit California horned lark and grasshopper sparrow by protecting existing habitats from potential loss or degradation that otherwise could occur with future changes in existing land use. A variety of habitat management actions included in *CM11 Natural Communities Enhancement and Management* that are designed to enhance wildlife values in restored or protected habitats could result in localized ground disturbances that could temporarily remove small amounts of modeled habitat. Ground-disturbing activities, such as removal of nonnative vegetation and road and other infrastructure maintenance activities, would be expected to have minor adverse effects on available habitat and would be expected to result in overall improvements to and maintenance of habitat values over the term of the BDCP.

Habitat management- and enhancement-related activities could disturb California horned lark and grasshopper sparrow nests. If either species were to nest in the vicinity of a worksite, equipment operation could destroy nests, and noise and visual disturbances could lead to their abandonment, resulting in mortality of eggs and nestlings. The potential for these activities to result in direct mortality of California horned lark and grasshopper sparrow would be minimized with the implementation of and Mitigation Measure BIO-75, *Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds*.

- *CM18 Conservation Hatcheries:* Implementation of CM18 would remove up to 35 acres of modeled California horned lark and grasshopper sparrow habitat.
- Operations and Maintenance: Postconstruction operation and maintenance of the above-ground water conveyance facilities and restoration infrastructure could result in ongoing but periodic disturbances that could affect California horned lark and grasshopper sparrow use of the surrounding habitat. Maintenance activities would include vegetation management, levee and structure repair, and re-grading of roads and permanent work areas. These effects, however, would be reduced by AMMs, Mitigation Measures, and conservation actions as described below.
- Injury and Direct Mortality: Construction-related activities would not be expected to result in direct mortality of adult or fledged California horned lark and grasshopper sparrow if they were present in the Plan Area, because they would be expected to avoid contact with construction and other equipment. If either species were to nest in the construction area, construction-related activities, including equipment operation, noise and visual disturbances could destroy nests or lead to their abandonment, resulting in mortality of eggs and nestlings. These effects would be avoided and minimized with the implementation of Mitigation Measure BIO-75.

The following paragraphs summarize the combined effects discussed above and describe other BDCP conservation actions that offset or avoid these effects. NEPA and CEQA impact conclusions are also included.

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the effects of construction would not be adverse under NEPA and would be less than significant under CEQA. The Plan would remove 3,881 acres of modeled (3,431 permanent, 450 temporary) breeding habitat for California horned lark and grasshopper sparrow in the study area in the near-term. These effects would result from the construction of the water conveyance facilities (CM1, 609 acres), and implementing other conservation measures (*CM2 Yolo Bypass Fisheries Enhancement*, *CM4 Tidal Natural Communities Restoration*, *CM5 Seasonally Inundated Floodplain Restoration*, *CM8 Grassland Natural Community Restoration*, *CM9 Vernal Pool and Alkali Seasonal Wetland Complex Restoration*, and *CM18 Conservation Hatcheries*—3,272 acres).

Typical NEPA and CEQA project-level mitigation ratios for those natural communities affected by CM1 would be 2:1 for protection of habitat. Using these typical ratios would indicate that 1,218 acres should be protected to mitigate for the CM1 losses of 609 acres of California horned lark and grasshopper sparrow habitat. The offsetting acreage would need to be 1,182 acres of protection if the east-west transmission line alignment was selected for Alternative 4. The near-term effects of other conservation actions would remove 3,272 acres of modeled habitat, and therefore require 6,544 acres of protection of California horned lark and grasshopper sparrow habitat using the same typical NEPA and CEQA ratio (2:1 for protection).

The BDCP has committed to near-term goals of protecting 2,000 acres and restoring 1,140 acres of grassland natural community in CZs 1, 2, 4, 5, 7, 8, and 11. In addition, 120 acres of alkali seasonal wetland complex would be restored and 58 acres would be protected in CZ 1, 8, and 11. The protection and restoration of grasslands and alkali seasonal wetlands, would result in a contiguous matrix of grassland, alkali seasonal wetland, and vernal pool natural communities which would expand breeding habitat for California horned lark and grasshopper sparrow and reduce the effects of current levels of habitat fragmentation. Under *CM11 Natural Communities Enhancement and Management*, insect prey populations would be increased on protected lands, enhancing the foraging value of these natural communities. These natural community biological goals and objectives would inform the near-term protection and restoration efforts and represent performance standards for considering the effectiveness of restoration actions for the species.

The acres of protection and restoration contained in the near-term Plan goals would satisfy the typical mitigation ratios that would be applied to the project-level effects of CM1. Some portion of the 14,600 acres of cultivated lands would be maintained as irrigated pasture, which would also provide nesting habitat. In order to reduce potential adverse effects of habitat loss from other near-term conservation actions, impacts to grassland habitat would need to be compensated for with 1:1 grassland restoration or 2:1 grassland protection. Impacts to irrigated pasture would need to be compensated with 2:1 protection of grassland or irrigated pasture. Mitigation Measure BIO-130 *Compensate for loss of nesting habitat for grasshopper sparrow in the near-term* would be available to address the near-term impacts to grassland habitat and the uncertainty of crop types protected and managed in the near-term. This would reduce the potential adverse effect of habitat loss from near-term conservation actions.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training, AMM2 Construction Best Management Practices and Monitoring, AMM3 Stormwater Pollution Prevention Plan, AMM4 Erosion and Sediment Control Plan, AMM5 Spill Prevention, Containment, and Countermeasure Plan, AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan*, and *AMM7 Barge Operations Plan*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas and disposal sites. The AMMs are described in detail in BDCP Appendix 3.C. California horned lark and grasshopper sparrow are not covered species under the BDCP and in order to have a less than adverse effect on individuals, preconstruction surveys for noncovered avian species would be required to ensure that nests are detected and avoided. Mitigation Measure BIO-75, *Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds*, would be available to address this potential adverse effect.

Late Long-Term Timeframe

Based on modeled habitat, the study area supports approximately 121,745 acres of modeled habitat for California horned lark and grasshopper sparrow. Alternative 4 as a whole would result in the permanent loss of and temporary effects on 8,272 acres of modeled California horned lark and grasshopper sparrow habitat during the term of the Plan (7% of the modeled habitat in the study area). The locations of these losses are described above in the analyses of individual conservation measures. The Plan includes a commitment to restore or create at least 2,000 acres of grassland in CZ 1, 8 and 11 and to protect 8,000 acres of grassland (with at least 2,000 acres protected in CZ 1, at least 1,000 acres in CZ 8, at least 2,000 acres protected in CZ 11, and the remainder distributed throughout CZ 1, 2, 4, 5, 7, 8, and 11 in the study area. In addition, 72 acres of alkali seasonal wetland would be restored and 150 acres would be protected in CZ 1, 8, and 11. The protection and restoration of grasslands and alkali seasonal wetlands, would result in a contiguous matrix of grassland, alkali seasonal wetland, and vernal pool natural communities which would expand breeding habitat for California horned lark and grasshopper sparrow and reduce the effects of current levels of habitat fragmentation. All protected habitat would be managed under *CM11 Natural Communities Enhancement and Management* to increase small mammal and insect prey populations on protected lands, enhancing the foraging value of these natural communities.

The loss of California horned lark and grasshopper sparrow habitat associated with Alternative 4 would represent an adverse effect as a result of habitat modification of special-status species and potential for mortality in the absence of other conservation actions. California horned lark and grasshopper sparrow are not covered species under the BDCP and in order to have a less than adverse effect on individuals, preconstruction surveys for noncovered avian species would be required to ensure that nests are detected and avoided. With habitat protection and restoration associated with CM3, CM8, CM9, and CM11, guided by biological goals and objectives and AMM1–AMM7, which would be in place throughout the time period any construction activity would be occurring, and the implementation of Mitigation Measure BIO-75, *Conduct preconstruction nesting bird surveys and avoid disturbance of nesting bird*, the effects of habitat loss and potential mortality under Alternative 4 on California horned lark and grasshopper sparrow would not be adverse under NEPA.

CEQA Conclusion: Alternative 4 (CM1, CM4, CM5, CM8, CM9, CM11 and CM18) would have both temporary and permanent impacts on California horned lark and grasshopper sparrow and their modeled habitat and operation of construction equipment could disturb individuals, if present in the study area.

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the impacts of construction would be less than significant. The Plan would remove 3,881 acres of modeled (3,431 permanent, 450 temporary) breeding habitat for California horned lark and grasshopper sparrow in the study area in the near-term. These impacts would result from the construction of the water conveyance facilities (CM1, 609 acres), and implementing other conservation measures (*CM2 Yolo Bypass Fisheries Enhancement*, *CM4 Tidal Natural Communities Restoration*, *CM5 Seasonally Inundated Floodplain Restoration*, *CM8 Grassland Natural Community Restoration*, *CM9 Vernal Pool and Alkali Seasonal Wetland Complex Restoration*, and *CM18 Conservation Hatcheries*—3,272 acres).

Typical NEPA and CEQA project-level mitigation ratios for those natural communities affected by CM1 would be 2:1 for protection of habitat. Using these typical ratios would indicate that 1,218 acres should be protected to mitigate for the CM1 losses of 609 acres of California horned lark and grasshopper sparrow habitat. The offsetting acreage would need to be 1,182 acres of protection if the east-west transmission line alignment was selected for Alternative 4. The near-term effects of other conservation actions would remove 3,272 acres of modeled habitat, and therefore require 6,544 acres of protection of California horned lark and grasshopper sparrow habitat using the same typical NEPA and CEQA ratio (2:1 for protection).

The BDCP has committed to near-term goals of protecting 2,000 acres and restoring 1,140 acres of grassland natural community in CZ 1, 2, 4, 5, 7, 8, and 11. In addition, 120 acres of alkali seasonal wetland complex would be restored and 58 acres would be protected in CZ 1, 8, and 11. The protection and restoration of grasslands and alkali seasonal wetlands, would result in a contiguous matrix of grassland, alkali seasonal wetland, and vernal pool natural communities which would expand breeding habitat for California horned lark and grasshopper sparrow and reduce the effects of current levels of habitat fragmentation. Under *CM11 Natural Communities Enhancement and Management*, small mammal and insect prey populations would be increased on protected lands, enhancing the foraging value of these natural communities. These natural community biological goals and objectives would inform the near-term protection and restoration efforts and represent performance standards for considering the effectiveness of restoration actions for the species.

The acres of protection and restoration contained in the near-term Plan goals would satisfy the typical mitigation ratios that would be applied to the project-level effects of CM1. Some portion of the 14,600 acres of cultivated lands would be maintained as irrigated pasture, which would also provide nesting habitat. In order to reduce potential adverse effects of habitat loss from other near-term conservation actions, impacts to grassland habitat would need to be compensated for with 1:1 grassland restoration or 2:1 grassland protection. Impacts to irrigated pasture would need to be compensated with 2:1 protection of grassland or irrigated pasture. Mitigation Measure BIO-130 *Compensate for loss of nesting habitat for grasshopper sparrow in the near-term* would address the near-term impacts to grassland habitat and the uncertainty of crop types protected and managed in the near-term. This would reduce the potential significant impact of habitat loss from near-term conservation actions.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training, AMM2 Construction Best Management Practices and Monitoring, AMM3 Stormwater Pollution Prevention Plan, AMM4 Erosion and Sediment Control Plan, AMM5 Spill Prevention, Containment, and Countermeasure Plan, AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan, and AMM7 Barge Operations Plan*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas and disposal sites. The AMMs are described in detail in BDCP Appendix 3.C. California horned lark and grasshopper sparrow are not covered species under the BDCP and in order to have a less-than-significant impact on individuals, preconstruction surveys for noncovered avian species would be required to ensure that nests are detected and avoided. Mitigation Measure BIO-75, *Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds*, would reduce the potential impact on nesting California horned lark and grasshopper sparrow to a less-than-significant impact.

Late Long-Term Timeframe

Based on modeled habitat, the study area supports approximately 121,745 acres of modeled habitat for California horned lark and grasshopper sparrow. Alternative 4 as a whole would result in the permanent loss of and temporary on 8,272 acres of modeled California horned lark and grasshopper sparrow habitat during the term of the Plan (7% of the modeled habitat in the study area). The locations of these losses are described above in the analyses of individual conservation measures. The Plan includes a commitment to restore or create at least 2,000 acres of grassland in CZ 1, 8 and 11 and to protect 8,000 acres of grassland (with at least 2,000 acres protected in CZ 1, at least 1,000 acres in CZ 8, at least 2,000 acres protected in CZ 11, and the remainder distributed throughout CZ 1, 2, 4, 5, 7, 8, and 11 in the study area. In addition, 72 acres of alkali seasonal wetland would be restored and 150 acres would be protected in CZ 1, 8, and 11. The protection and restoration of grasslands and alkali seasonal wetlands, would result in a contiguous matrix of grassland, alkali seasonal wetland, and vernal pool natural communities which would expand breeding habitat for California horned lark and grasshopper sparrow and reduce the effects of current levels of habitat fragmentation. All protected habitat would be managed under *CM11 Natural Communities Enhancement and Management* to increase small mammal and insect prey populations on protected lands, enhancing the foraging value of these natural communities. California horned lark and grasshopper sparrow are not covered species under the BDCP and in order to have a less-than-significant impact on individuals, preconstruction surveys for noncovered avian species would be required to ensure that nests are detected and avoided. Mitigation Measure BIO-75 would reduce the potential impact on nesting California horned lark and grasshopper sparrow to a less-than-significant impact.

Considering these protection and restoration provisions, which would provide acreages of new high-value or enhanced habitat in amounts suitable to compensate for habitats lost to construction and restoration activities, and with the implementation of AMM1–AMM7, and Mitigation Measure BIO-75, the loss of habitat or direct mortality through implementation of Alternative 4 would not result in a substantial adverse effect through habitat modifications and would not substantially reduce the number or restrict the range of either species. Therefore, the loss of habitat or potential mortality under this alternative would have a less-than-significant impact on California horned lark and grasshopper sparrow.

Mitigation Measure BIO-75: Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds

See Mitigation Measure BIO-75 under Impact BIO-75.

Mitigation Measure BIO-130: Compensate for loss of nesting habitat for grasshopper sparrow

Impacts on grassland habitat will be compensated for at a ratio of 1:1 for restoration or 2:1 for protection of grassland in the near-term timeframe. Impacts on irrigated pasture will be compensated for at a ratio of 2:1 for protection of grassland or irrigated pasture in the near-term timeframe.

Impact BIO-131: Effects on grasshopper sparrow and California horned lark associated with electrical transmission facilities

New transmission lines would increase the risk for bird-power line strikes, which could result in injury or mortality of grasshopper sparrow and California horned lark. *AMM20 Greater Sandhill Crane*, would minimize the risk of bird strikes. Thus, there would be no adverse effect.

CEQA Conclusion: New transmission lines would increase the risk for bird-power line strikes, which could result in injury or mortality of grasshopper sparrow and California horned lark. With the incorporation of *AMM20 Greater Sandhill Crane*, new transmission lines would have a less-than-significant impact on grasshopper sparrow and California horned lark.

Impact BIO-132: Indirect effects of plan implementation on grasshopper sparrow and California horned lark

Noise and visual disturbances associated with construction-related activities could result in temporary disturbances that affect California horned lark and grasshopper sparrow use of modeled habitat. Indirect effects associated with construction include noise, dust, and visual disturbance caused by grading, filling, contouring, and other ground-disturbing operations. Construction-related noise and visual disturbances could disrupt nesting and foraging behaviors, and reduce the functions of suitable habitat which could result in an adverse effect on these species. Mitigation Measure BIO-75, *Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds*, would be available to minimize potential adverse effects to active nests. The use of mechanical equipment during water conveyance construction could cause the accidental release of petroleum or other contaminants that could affect these species or their prey in the surrounding habitat. AMMs 1–AMM7, including *AMM2 Construction Best Management Practices and Monitoring*, would minimize the likelihood of such spills from occurring. The inadvertent discharge of sediment or excessive dust adjacent to grasshopper sparrow and California horned lark habitat could also have a negative effect on these species. AMM1–AMM7 would ensure that measures are in place to prevent runoff from the construction area and the negative effects of dust on wildlife adjacent to work areas.

CEQA Conclusion: Indirect effects on grasshopper sparrow and California horned lark as a result of constructing the water conveyance facilities could have a significant impact on these species. The incorporation of AMM1–AMM7 into the BDCP and the implementation of Mitigation Measure BIO-75, *Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds*, would reduce this impact to a less-than-significant level.

Mitigation Measure BIO-75: Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds

See Mitigation Measure BIO-75 under Impact BIO-75.

Impact BIO-133: Periodic effects of inundation on grasshopper sparrow and California horned lark as a result of implementation of conservation components

Flooding of the Yolo Bypass from Fremont Weir operations (*CM2 Yolo Bypass Fisheries Enhancement*) would increase the frequency and duration of inundation on approximately 777–2,423 acres of modeled California horned lark and grasshopper sparrow habitat (Table 12-4-48).

Based on hypothetical footprints, implementation of *CM5 Seasonally Inundated Floodplain Restoration*, could result in the periodic inundation of up to approximately 656 acres of modeled habitat (Table 12-4-48).

Reduced foraging habitat availability may be expected during the fledgling period of the nesting season due to periodic inundation. However, inundation would occur during the non-breeding season and would not be expected to have an adverse effect on either species.

CEQA Conclusion: Periodic inundation of floodplains would not have a significant impact on grasshopper sparrow or California horned lark because inundation is expected to occur prior to the breeding season.

Least Bittern and White-Faced Ibis

Modeled breeding habitat for least bittern and white-faced ibis includes tidal freshwater and tidal brackish emergent wetlands, nontidal freshwater emergent wetlands, managed wetlands, and other natural seasonal wetlands in CZ 2, 4, and 11. Construction and restoration associated with Alternative 4 conservation measures would result in both temporary and permanent losses of modeled habitat for mountain plover as indicated in Table 12-4-49. Full implementation of Alternative 4 would restore or create 55,000 acres of tidal natural communities, 320 acres of managed wetland, and 1,200 acres of nontidal marsh. In addition, 6,500 acres of managed wetlands and 50 acres of nontidal marsh would be protected (Table 12-4-49). As explained below, with the restoration or protection of these amounts of habitat, impacts to least bittern and white-faced ibis would not be adverse for NEPA purposes and would be less than significant for CEQA purposes.

Table 12-4-49. Changes in Least Bittern and White-Faced Ibis Modeled Habitat Associated with Alternative 4 (acres)[a]

	Conservation Measure[b]	Habitat Type	Permanent		Temporary		Periodic[d]	
			NT	LLT	NT	LLT	Yolo	Floodplain
Habitat Affected[c]	CM1		1	1	2	2	NA	NA
	Total Impacts CM1		**1**	**1**	**2**	**2**		
	CM2–CM18		4,733	12,660	43	43	691–2,171	NA
	Total Impacts CM2–CM18		**4,733**	**12,660**	**43**	**43**	**691–2,171**	**NA**
	TOTAL IMPACTS		**4,734**	**12,661**	**45**	**45**	**691–2,171**	**NA**
	CM3 managed wetland		320	320	NA	NA	NA	NA
	CM4 tidal wetland		13,800	55,000	NA	NA	NA	NA
	CM10 nontidal marsh		400	1,200	NA	NA	NA	NA
	Total Restoration/Creation		**14,520**	**56,520**				
Habitat Protected[e]	CM3 managed wetlands		3,200	6,500	NA	NA	NA	NA
	CM3 nontidal marsh		25	50	NA	NA	NA	NA
	Total Protection		**3,225**	**6,550**				

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late long-term timeframes.

[b] See discussion below for a description of applicable CMs.

[c] LLT acreages are a summation of effects that would occur in the near-term, early long-term and late long-term timeframes. The LLT acreages represent the total amount of habitat that would be affected over the 50-year life of the BDCP and do not reflect habitat increases that would result from restoration, creation and protection activities.

[d] Periodic effects were estimated for the late long-term only. Yolo periodic impacts are presented as a range based on different flow regimes at the proposed notch in Fremont Weir.

[e] Restored/created and protected habitat acreages represent planned conservation activities that would be implemented over the lifetime of the BDCP (see BDCP Chapter 3, *Conservation Strategy*, for specifics).

NT	= near-term
LLT =	late long-term
NA =	not applicable

Impact BIO-134: Loss or conversion of habitat for and direct mortality of least bittern and white-faced ibis

Alternative 4 conservation measures would result in the combined permanent and temporary loss and conversion of up to 12,706 acres of modeled habitat for least bittern and white-faced ibis (12,661 acres of permanent loss and conversion and 45 of temporary loss, Table 12-4-49). Conservation measures that would result in these losses are conveyance facilities and transmission line construction, and establishment and use of borrow and spoil areas (CM1), Yolo Bypass fisheries improvements (CM2), and tidal habitat restoration (CM4). Habitat enhancement and management activities (CM11), which include ground disturbance or removal of nonnative vegetation, could result in local adverse habitat effects. In addition, maintenance activities associated with the long-term operation of the water conveyance facilities and other BDCP physical facilities could degrade or eliminate least bittern and white-faced ibis habitat. Each of these individual activities is described below. A summary statement of the combined impacts and NEPA and CEQA conclusions follows the individual conservation measure discussions.

- *CM1 Water Facilities and Operation:* Construction of Alternative 4 conveyance facilities would result in the combined permanent and temporary loss of up to 3 acres of modeled least bittern and white-faced ibis habitat (1 acre of permanent loss, 2 acres of temporary loss) from CZ 4. Refer to the Terrestrial Biology Map Book for a detailed view of Alternative 4 construction locations.

  There would be an 2-acre increase in the combined permanent and temporary loss of least bittern and white-faced ibis habitat associated with the construction of the east-west transmission line for the Alternative 4 water conveyance facilities rather than the north-south transmission line in CZ 4.

- *CM2 Yolo Bypass Fisheries Enhancement:* Construction of the Yolo bypass fisheries enhancement would permanently remove 30 acres of modeled least bittern and white-faced ibis habitat in the Yolo Bypass in CZ 2. In addition, 44 acres of habitat would be temporarily removed.

- *CM4 Tidal Natural Communities Restoration:* Tidal habitat restoration site preparation and inundation would permanently remove an estimated 12,631 acres of modeled least bittern and white-faced ibis habitat in CZ 2, 4, and 11.

- *CM11 Natural Communities Enhancement and Management:* A variety of habitat management actions included in *CM11 Natural Communities Enhancement and Management* that are designed to enhance wildlife values in restored or protected habitats could result in localized ground disturbances that could temporarily remove small amounts of least bittern and white-faced ibis habitat. Ground-disturbing activities, such as removal of nonnative vegetation and road and other infrastructure maintenance activities, would be expected to have minor adverse effects on available least bittern and white-faced ibis habitat.

- Operations and Maintenance: Postconstruction operation and maintenance of the above-ground water conveyance facilities and restoration infrastructure could result in ongoing but periodic disturbances that could affect least bittern and white-faced ibis use of the surrounding habitat.

Maintenance activities would include vegetation management, levee and structure repair, and re-grading of roads and permanent work areas. These effects, however, would be reduced by AMMs and conservation actions and Mitigation Measure BIO-75, *Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds*, would be available to further reduce potential adverse effects as described below.

- Injury and Direct Mortality: Construction-related activities would not be expected to result in direct mortality of least bittern and white-faced ibis because adults and fledged young would be expected to avoid contact with construction and other equipment. However, if either species were to nest in the construction area, equipment operation, noise and visual disturbances could destroy nests or lead to their abandonment, resulting in mortality of eggs and nestlings. Mitigation Measure BIO-75 would be available to address these potential adverse effects.

The following paragraphs summarize the combined effects discussed above and describe other BDCP conservation actions that offset or avoid these effects. NEPA and CEQA impact conclusions are also included.

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the effects of construction would not be adverse under NEPA and would be less than significant under CEQA. The Plan would remove 4,779 acres of modeled (4,734 acres of permanent loss, and 45 acres of temporary loss) habitat for least bittern and white-faced ibis in the study area in the near-term. These effects would result from the construction of the water conveyance facilities (CM1, 3 acres), and implementing other conservation measures (Yolo Bypass Fisheries Enhancement [CM2], and Tidal Natural Communities Restoration [CM4] 4,776 acres).

Typical NEPA and CEQA project-level mitigation ratios for those natural communities affected by CM1 would be 1:1 for restoration/creation and 1:1 protection of least bittern and white-faced ibis habitat. Using these typical ratios would indicate that 3 acres of habitat should be restored and 3 acres of habitat should be protected to mitigate for the CM1 losses of 3 acres of least bittern and white-faced ibis habitat. The offsetting acreage would need to be 5 acres each of restoration and protection if the east-west transmission line alignment was selected for Alternative 4. The near-term effects of other conservation actions would remove 4,776 acres of modeled habitat, and therefore require 4,776 acres of restoration and 4,776 acres of protection of least bittern and white-faced ibis habitat using the same typical NEPA and CEQA ratios (1:1 for restoration and 1:1 for protection).

The BDCP has committed to near-term goals of restoring 13,800 acres of tidal natural communities, restoring 400 acres of nontidal marsh, and 320 acres of managed wetland (managed wetland would be restored in CZ 3, 4, 5, or 6). In addition, 3,200 acres of managed wetland in CZ 11, and 25 acres of nontidal marsh would be protected in the near-term. The acres of protection and restoration contained in the near-term Plan goals would satisfy the typical mitigation ratios that would be applied to the project-level effects of CM1. The combined restoration and protection of wetland natural communities in the near-term would also compensate for the near-term losses of least bittern and white-faced ibis habitat from other conservation actions.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training, AMM2 Construction Best Management Practices and Monitoring, AMM3 Stormwater Pollution Prevention*

Plan, AMM4 Erosion and Sediment Control Plan, AMM5 Spill Prevention, Containment, and Countermeasure Plan, AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan, and *AMM7 Barge Operations Plan*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas and disposal sites. The AMMs are described in detail in BDCP Appendix 3.C. Least bittern and white-faced ibis are not covered species under the BDCP and in order to have a less than adverse effect on individuals, preconstruction surveys for noncovered avian species would be required to ensure that nests are detected and avoided.

Late Long-Term Timeframe

Alternative 4 as a whole would result in the permanent loss of and temporary effects on 12,703 acres of least bittern and white-faced ibis habitat during the term of the Plan. The locations of these losses are described above in the analyses of individual conservation measures. The Plan includes a commitment to restore or create 55,000 acres of tidal natural communities, 1,200 acres of nontidal marsh, and 320 acres of managed wetland (managed wetland would be restored in CZ 3, 4, 5, or 6). In addition, 6,550 acres of managed wetland in CZ 11, and 50 acres of nontidal marsh would be protected during the term of the Plan.

The loss of least bittern and white-faced ibis habitat associated with Alternative 4 would represent an adverse effect as a result of habitat modification of a special-status species and potential for direct mortality in the absence of other conservation actions. However, with habitat protection and restoration associated with CM3, CM8, and CM11, guided by biological goals and objectives and AMM1–AMM7, which would be in place throughout the time period any construction activity would be occurring, and the implementation of Mitigation Measure BIO-75, *Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds*, the effects of habitat loss and potential mortality under Alternative 4 on least bittern and white-faced ibis would not be adverse under NEPA.

CEQA Conclusion: Alternative 4 (CM1–CM11) would have both temporary and permanent impacts on least bittern and white-faced ibis and their modeled habitat and operation of construction equipment could injure or disturb individuals, if present in the study area.

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the impacts of construction would be less than significant. The Plan would remove 4,779 acres of modeled (4,734 acres of permanent loss, and 45 acres of temporary loss) habitat for least bittern and white-faced ibis in the study area in the near-term. These impacts would result from the construction of the water conveyance facilities (CM1, 3 acres), and implementing other conservation measures (*CM2 Yolo Bypass Fisheries Enhancement* and *CM4 Tidal Natural Communities Restoration*, 4,776 acres).

Typical NEPA and CEQA project-level mitigation ratios for those natural communities affected by CM1 would be 1:1 for restoration/creation and 1:1 protection of least bittern and white-faced ibis habitat. Using these typical ratios would indicate that 3 acres of habitat should be restored and 3 acres of habitat should be protected to mitigate for the CM1 losses of 3 acres of least bittern and white-faced ibis habitat. The offsetting acreage would need to be 5 acres each of restoration and protection if the east-west transmission line alignment was selected for Alternative 4. The near-term effects of other conservation actions would remove 4,776 acres of modeled habitat, and therefore require 4,776 acres of restoration and 4,776 acres of protection of least bittern and white-faced ibis habitat using the same typical NEPA and CEQA ratios (1:1 for restoration and 1:1 for protection).

The BDCP has committed to near-term goals of restoring 13,800 acres of tidal natural communities, restoring 400 acres of nontidal marsh, and 320 acres of managed wetland (managed wetland would be restored in CZ 3, 4, 5, or 6). In addition, 3,200 acres of managed wetland in CZ 11, and 25 acres of nontidal marsh would be protected in the near-term. The BDCP has committed to near-term goals of restoring 13,800 acres of tidal natural communities, restoring 400 acres of nontidal marsh, and 320 acres of managed wetland (managed wetland would be restored in CZ 3, 4, 5, or 6). In addition, 3,200 acres of managed wetland in CZ 11, and 25 acres of nontidal marsh would be protected in the near-term. The acres of protection and restoration contained in the near-term Plan goals would satisfy the typical mitigation ratios that would be applied to the project-level effects of CM1. The combined restoration and protection of wetland natural communities in the near-term would also compensate for the near-term losses of least bittern and white-faced ibis habitat from other conservation actions.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training, AMM2 Construction Best Management Practices and Monitoring, AMM3 Stormwater Pollution Prevention Plan, AMM4 Erosion and Sediment Control Plan, AMM5 Spill Prevention, Containment, and Countermeasure Plan, AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan, and AMM7 Barge Operations Plan*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas and disposal sites. The AMMs are described in detail in BDCP Appendix 3.C. Least bittern and white-faced ibis are not covered species under the BDCP and in order to have a less than adverse effect on individuals, preconstruction surveys for noncovered avian species would be required to ensure that nests are detected and avoided.

Late Long-Term Timeframe

Alternative 4 as a whole would result in the permanent loss of and temporary effects on 12,703 acres of least bittern and white-faced ibis habitat during the term of the Plan. The locations of these losses are described above in the analyses of individual conservation measures. The Plan includes a commitment to restore or create 55,000 acres of tidal natural communities, 1,200 acres of nontidal marsh, and 320 acres of managed wetland (managed wetland would be restored in CZs 3, 4, 5, or 6). In addition, 6,550 acres of managed wetland in CZ 11, and 50 acres of nontidal marsh would be protected during the term of the Plan.

Considering these protection and restoration provisions, which would provide acreages of new high-value or enhanced habitat in amounts suitable to compensate for habitats lost to construction and restoration activities, and with the implementation of AMM1–AMM7, and Mitigation Measure BIO-75, *Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds*, the loss of habitat or direct mortality through implementation of Alternative 4 would not result in a substantial adverse effect through habitat modifications and would not substantially reduce the number or restrict the range of the species. Therefore, the loss of habitat or potential mortality under this alternative would have a less-than-significant impact on mountain plover.

Mitigation Measure BIO-75: Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds

See Mitigation Measure BIO-75 under Impact BIO-75.

Impact BIO-135: Effects on least bittern and white-faced ibis associated with electrical transmission facilities

New transmission lines would increase the risk for bird-power line strikes, which could result in injury or mortality of least bittern and white-faced ibis. The risk for bird-power line strikes, would be minimized for lesser sandhill crane with the incorporation of *AMM20 Greater Sandhill Crane* into the BDCP. This measure would ensure that conductor and ground lines are fitted with flight diverters in compliance with the best available practices, such as those specified in the USFWS Avian Protection Guidelines and would further ensure no adverse effect from electrical transmission facilities.

CEQA Conclusion: New transmission lines would increase the risk for bird-power line strikes, which could result in injury or mortality of least bittern and white-faced ibis. With the incorporation of *AMM20 Greater Sandhill Crane* into the BDCP, new transmission lines would have a less-than-significant impact on least bittern and white-faced ibis.

Impact BIO-136: Indirect effects of plan implementation on least bittern and white-faced ibis

Indirect construction-related effects: Noise and visual disturbances associated with construction-related activities could result in temporary disturbances that affect least bittern and white-faced ibis use of modeled habitat. Indirect effects associated with construction include noise, dust, and visual disturbance caused by grading, filling, contouring, and other ground-disturbing operations. Construction-related noise and visual disturbances could disrupt nesting and foraging behaviors, and reduce the functions of suitable habitat which could result in an adverse effect on these species. Mitigation Measure BIO-75, *Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds*, would be available to minimize potential adverse effects to active nests. The use of mechanical equipment during water conveyance construction could cause the accidental release of petroleum or other contaminants that could affect these species or their prey in the surrounding habitat. AMMs 1–7 including *AMM2 Construction Best Management Practices and Monitoring* would minimize the likelihood of such spills from occurring. The inadvertent discharge of sediment or excessive dust adjacent to least bittern and white-faced ibis could also have a negative effect on these species. AMM1–AMM7 would ensure that measures are in place to prevent runoff from the construction area and the negative effects of dust on wildlife adjacent to work areas.

Methylmercury Exposure: Marsh (tidal and nontidal) and floodplain restoration have the potential to increase exposure to methylmercury. Mercury is transformed into the more bioavailable form of methylmercury in aquatic systems, especially areas subjected to regular wetting and drying such as tidal marshes and flood plains (Alpers et al. 2008). Thus, BDCP restoration activities that create newly inundated areas could increase bioavailability of mercury (see BDCP Chapter 3, *Conservation Strategy*, for details of restoration). Species sensitivity to methylmercury differs widely and there is a large amount of uncertainty with respect to species-specific effects. Increased methylmercury associated with natural community and floodplain restoration could indirectly affect least bittern and white-faced ibis, via uptake in lower tropic levels (as described in the BDCP, Appendix 5.D, *Contaminants*).

In addition, the potential mobilization or creation of methylmercury within the Plan Area varies with site-specific conditions and would need to be assessed at the project level. Measures described in Chapter 3 of the BDCP, Section 3.4.13, *CM12 Methylmercury Management* include provisions for Project-specific Mercury Management Plans. Site-specific restoration plans that address the creation and mobilization of mercury, as well as monitoring and adaptive management as described in CM12 would be available to address the uncertainty of methylmercury levels in restored tidal marsh and potential impacts on least bittern and white-faced ibis.

CEQA Conclusion: Indirect effects on least bittern and white-faced ibis as a result of constructing the water conveyance facilities could have a significant impact on these species. The incorporation of AMM1–AMM7 into the BDCP and the implementation of Mitigation Measure BIO-75, *Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds*, would reduce this impact to a less-than-significant level. Increased methylmercury associated with natural community and floodplain restoration could indirectly affect least bittern and white-faced ibis, via uptake in lower tropic levels (as described in the BDCP, Appendix 5.D, *Contaminants*). In addition, the potential mobilization or creation of methylmercury within the Plan Area varies with site-specific conditions and would need to be assessed at the project level. Measures described in Chapter 3 of the BDCP, Section 3.4.13, *CM12 Methylmercury Management* include provisions for Project-specific Mercury Management Plans. Site-specific restoration plans that address the creation and mobilization of mercury, as well as monitoring and adaptive management as described in CM12 would better inform potential impacts and address the uncertainty of methylmercury levels in restored tidal marsh in the study area.

Mitigation Measure BIO-75: Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds

See Mitigation Measure BIO-75 under Impact BIO-75.

Impact BIO-137: Periodic effects of inundation on least bittern and white-faced ibis as a result of implementation of conservation components

Flooding of the Yolo Bypass from Fremont Weir operations (*CM2 Yolo Bypass Fisheries Enhancement*) would increase the frequency and duration of inundation on approximately 691-2,171 acres of modeled least bittern and white-faced ibis habitat (Table 12-4-49). However, no adverse effects of increased inundation frequency on nesting habitat are expected because wetland vegetation has persisted under the existing Yolo Bypass flooding regime, and changes to frequency and inundation are within the tolerance of these vegetation types. Inundation would occur in the non-breeding season and wetlands supporting habitat would not be expected to be affected by flood flows.

CEQA Conclusion: Periodic inundation of Yolo Bypass would not be expected to have a significant impact on least bittern or white-faced ibis because wetland vegetation has persisted under the existing Yolo Bypass flooding regime, and changes to frequency and inundation are within the tolerance of these vegetation types.

Loggerhead Shrike

Modeled habitat for loggerhead shrike includes both high-value and low-value modeled habitat. High-value habitat includes grassland and alkali seasonal wetland natural communities and cultivated lands, including irrigated pasture and grain and hay crops. Low-value habitat includes row crops such as truck and berry crops and field crops which are not considered to be valuable habitat for the species but were included in the model as they may provide foraging opportunities.

Construction and restoration associated with Alternative 4 conservation measures would result in both temporary and permanent losses of modeled habitat for loggerhead shrike as indicated in Table 12-4-50. Full implementation of Alternative 4 would restore or create 2,000 acres of grassland natural community and 72 acres of alkali seasonal wetland complex. In addition, 8,000 acres of grassland, 150 acres of alkali seasonal wetland complex, and 45,405 acres of cultivated lands would be protected (Table 12-4-50). As explained below, with the restoration or protection of these amounts of habitat, impacts on loggerhead shrike would not be adverse for NEPA purposes and would be less than significant for CEQA purposes.

Table 12-4-50. Changes in Loggerhead Shrike Modeled Habitat Associated with Alternative 4 (acres)[a]

	Conservation Measure[b]	Habitat Type	Permanent		Temporary		Periodic[d]	
			NT	LLT	NT	LLT	Yolo	Floodplain
Habitat Affected[c]	CM1	High-value	1,568	1,568	628	628	NA	NA
		Low-value	1,553	1,553	597	597		
	Total Impacts CM1		**3,121**	**3,121**	**1,225**	**1,225**		
	CM2–CM18	High-value	5,151	25,252	165	633	894-2,460	3,470
		Low-value	1,874	17,353	0	526	1,227-1,858	4,375
	Total Impacts CM2–CM18		**7,025**	**42,605**	**165**	**1,159**	**2,121-4,318**	**7,845**
	TOTAL IMPACTS		**10,146**	**45,726**	**1,390**	**2,384**	**2,121-4,318**	**7,845**
Habitat Restored/ Created[e]	CM8 grassland		1,140	2,000	NA	NA	NA	NA
	CM3 alkali seasonal wetland		48	72	NA	NA	NA	NA
	Total Restoration/Creation		**1,188**	**2,072**				
Habitat Protected[e]	CM3 grassland		2,000	8,000	NA	NA	NA	NA
	CM3 alkali seasonal wetland		120	150	NA	NA	NA	NA
	CM3 cultivated lands (non-rice)		14,600	45,405	NA	NA	NA	NA
	Total Protection		**16,720**	**53,555**				

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late long-term timeframes.

[b] See discussion below for a description of applicable CMs.

[c] LLT acreages are a summation of effects that would occur in the near-term, early long-term and late long-term timeframes. The LLT acreages represent the total amount of habitat that would be affected over the 50-year life of the BDCP and do not reflect habitat increases that would result from restoration, creation and protection activities.

[d] Periodic effects were estimated for the late long-term only. Yolo periodic impacts are presented as a range based on different flow regimes at the proposed notch in Fremont Weir.

[e] Restored/created and protected habitat acreages represent planned conservation activities that would be implemented over the lifetime of the BDCP (see BDCP Chapter 3, *Conservation Strategy*, for specifics).

NT = near-term

LLT = late long-term

NA = not applicable

Impact BIO-138: Loss or conversion of modeled habitat for and direct mortality of loggerhead shrike

Alternative 4 conservation measures would result in the combined permanent loss or conversion and temporary loss of up to 48,110 acres of modeled habitat for loggerhead shrike (28,081 acres of which would be high-value habitat, Table 12-4-50). Conservation measures that would result in these losses or conversions are conveyance facilities and transmission line construction, and establishment and use of borrow and spoil areas (CM1), Yolo Bypass improvements (CM2), tidal habitat restoration (CM4), floodplain restoration (CM5), riparian habitat restoration (CM7), grassland restoration (CM8), vernal pool and wetland restoration (CM9), marsh restoration (CM10) and construction of conservation hatcheries (CM18). The majority of habitat loss would result from conversion of cultivated lands to tidal natural communities through CM4. Habitat enhancement and management activities (CM11), which include ground disturbance or removal of nonnative vegetation, could result in local adverse habitat effects. In addition, maintenance activities associated with the long-term operation of the water conveyance facilities and other BDCP physical facilities could degrade or eliminate loggerhead shrike modeled habitat. Each of these individual activities is described below. A summary statement of the combined impacts and NEPA and CEQA conclusions follows the individual conservation measure discussions.

- *CM1 Water Facilities and Operation:* Construction of Alternative 4 conveyance facilities would result in the combined permanent and temporary loss of up to 4,346 acres of modeled loggerhead shrike habitat. This would be comprised of 2,196 acres of high-value habitat (1,568 permanent loss or conversion, 628 temporary loss or conversion) and 2,150 acres of low-value cultivated lands (1,553 permanent loss, 597 temporary loss) from CZs 3–6 and CZ 8. The majority of habitat removed would be grassland and cultivated lands. Refer to the Terrestrial Biology Map Book for a detailed view of Alternative 4 construction locations. Construction of the water conveyance facilities would occur in the near-term timeframe.

  There would be a 115-acre decrease in the combined permanent and temporary loss of loggerhead shrike habitat associated with the construction of the east-west transmission line for the Alternative 4 water conveyance facilities rather than the north-south transmission line in CZ 4. This decrease in impact would consist of a 49-acre decrease in the loss of high-value habitat and a 66-acre decrease in the loss of low-value cultivated lands.

- *CM2 Yolo Bypass Fisheries Enhancement:* Construction of the Yolo bypass fisheries enhancement would permanently remove 481 acres of modeled loggerhead shrike habitat (405 acres of high-value habitat, 76 acres of low-value habitat) in the Yolo Bypass in CZ 2. In addition, 165 acres of high-value grassland habitat would be temporarily removed. These losses would occur in the near-term timeframe.

- *CM4 Tidal Natural Communities Restoration:* Tidal habitat restoration site preparation and inundation would permanently remove an estimated 34,954 acres of modeled loggerhead shrike habitat (21,640 acres of high-value habitat, 13,314 acres of low-value habitat). These losses would consist of conversion of grassland and cultivated land to tidal natural communities in CZs 1, 2, 4, 5, 6, 7, 8, 10 and 11. Tidal restoration would directly impact and fragment grassland just north of Rio Vista in and around French and Prospect Islands, and in an area south of Rio Vista around Threemile Slough.

- *CM5 Seasonally Inundated Floodplain Restoration:* Construction of setback levees to restore seasonally inundated floodplain (CM5) and riparian restoration activities (CM7) would permanently and temporarily remove approximately 6,055 acres of modeled loggerhead shrike habitat (2,653 acres of high-value habitat, 3,402 acres of low-value habitat. These losses would be expected to occur along the San Joaquin River and other major waterways in CZ 7.

- *CM8 Grassland Natural Community Restoration* and *CM9 Vernal Pool and Alkali Seasonal Wetland Complex Restoration:* Conversion of 1,285 acres of cultivated lands to grassland habitat would result from implementation of CM8 and CM9 in CZs 1, 8, and 11. However, The resulting restoration of 2,000 acres of grassland and 72 acres of alkali seasonal wetland would provide high-value habitat for loggerhead shrike.

- *CM10 Nontidal Marsh Restoration:* Nontidal marsh restoration (CM10) would result in the conversion of 789 acres of modeled loggerhead shrike habitat (497 acres of high-value habitat consisting of irrigated pasture and grain and hay crops, 292 acres of low-value cultivated lands) to nontidal marsh in CZ 2 and CZ 4.

- *CM11 Natural Communities Enhancement and Management:* The protection of 8,000 acres of grassland, 150 acres of alkali seasonal wetland, and 45,405 acres of cultivated lands through *CM3 Natural Communities Protection and Restoration* and the enhancement of these communities (CM11) for covered species is also expected to benefit loggerhead shrike by protecting existing habitats from potential loss or degradation that otherwise could occur with future changes in existing land use. A variety of habitat management actions included in *CM11 Natural Communities Enhancement and Management* that are designed to enhance wildlife values in restored or protected habitats could result in localized ground disturbances that could temporarily remove small amounts of modeled habitat. Ground-disturbing activities, such as removal of nonnative vegetation and road and other infrastructure maintenance activities, would be expected to have minor adverse effects on available habitat and would be expected to result in overall improvements to and maintenance of habitat values over the term of the BDCP.

  Habitat management- and enhancement-related activities could loggerhead shrike nests. If either species were to nest in the vicinity of a worksite, equipment operation could destroy nests, and noise and visual disturbances could lead to their abandonment, resulting in mortality of eggs and nestlings. Mitigation Measure BIO-75, *Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds*, would be available to address these potential adverse effects.

- *CM18 Conservation Hatcheries:* Implementation of CM18 would remove up to 35 acres of modeled loggerhead shrike habitat in CZ 2.

- Operations and Maintenance: Postconstruction operation and maintenance of the above-ground water conveyance facilities and restoration infrastructure could result in ongoing but periodic disturbances that could affect loggerhead shrike use of the surrounding habitat. Maintenance activities would include vegetation management, levee and structure repair, and re-grading of roads and permanent work areas. These effects, however, would be reduced by AMMs, Mitigation Measures, and conservation actions as described below.

- Injury and Direct Mortality: Construction-related activities would not be expected to result in direct mortality of adult or fledged loggerhead shrike if they were present in the Plan Area, because they would be expected to avoid contact with construction and other equipment. If either species were to nest in the construction area, construction-related activities, including equipment operation, noise and visual disturbances could destroy nests or lead to their abandonment, resulting in mortality of eggs and nestlings. Mitigation Measure BIO-75 would be available to address these potential adverse effects.

The following paragraphs summarize the combined effects discussed above and describe other BDCP conservation actions that offset or avoid these effects. NEPA and CEQA impact conclusions are also included.

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the effects of construction would not be adverse under NEPA and would be less than significant under CEQA. The Plan would remove 11,536 acres of modeled (7,512 acres of high-value, 4,024 acres of low-value) habitat for loggerhead shrike in the study area in the near-term. These effects would result from the construction of the water conveyance facilities (CM1, 2,196 acres high-value habitat, 2,150 acres low-value habitat), and implementing other conservation measures (*CM2 Yolo Bypass Fisheries Enhancement*, *CM4 Tidal Natural Communities Restoration*, *CM5 Seasonally Inundated Floodplain Restoration*, *CM7 Riparian Natural Community Restoration*, *CM8 Grassland Natural Community Restoration*, *CM9 Vernal Pool and Alkali Seasonal Wetland Complex Restoration*, *CM10 Nontidal Marsh Restoration*, and *CM18 Conservation Hatcheries*—5,316 acres high-value habitat and 1,874 acres low-value habitat).

Typical NEPA and CEQA project-level mitigation ratios for those natural communities affected by CM1 would be 2:1 protection of high-value habitat, and 1:1 protection of low-value habitat. Using these typical ratios would indicate that 4,392 acres should be protected to compensate for the loss of high-value habitat from CM1 and that 2,150 acres should be protected to compensate for the loss of low-value loggerhead shrike habitat from CM1. The offsetting acreage would need to be 4,294 acres of protection for the loss of high-value habitat and 2,084 acres of protection for the loss of low-value habitat to mitigate for the CM1 losses if the east-west transmission line alignment was selected for Alternative 4. The near-term effects of other conservation actions would require 10,632 acres of protection to compensate for the loss of high-value shrike habitat and 1,874 acres of protection to compensate for the loss of low-value habitat using the same typical NEPA and CEQA ratios (2:1 protection for the loss of high-value habitat, 1:1 protection for the loss of low-value habitat).

The BDCP has committed to near-term goals of protecting 2,000 acres and restoring 1,140 acres of grassland natural community in CZs 1, 2, 4, 5, 7, 8, and 11. In addition, 48 acres of alkali seasonal wetland complex restored, 14,600 acres of cultivated lands would be protected, and 120 acres of alkali seasonal wetland complex would be protected. The protection and restoration of grasslands would be part of a contiguous matrix of grassland, alkali seasonal wetland, and vernal pool natural communities which would expand habitat for loggerhead shrike and reduce the effects of current levels of habitat fragmentation. In addition, the protection of 14,600 acres of cultivated lands would benefit loggerhead shrike. Under *CM3 Natural Communities Protection and Restoration*, and *CM11 Natural Communities Enhancement and Management*, small mammal and insect prey populations would be increased on protected grassland and cultivated lands, enhancing the foraging value of these natural communities for the shrike. In addition, there is a commitment in the plan (Objective CLNC1.3) to maintain and protect small patches of trees and shrubs within cultivated lands that could provide breeding habitat for the species. Species specific goals and objectives would also benefit loggerhead shrike. These include SH1.1 which commits to managing at least 36,725 acres (out of the 45,405 acres of protected cultivated lands) for Swainson's hawk foraging habitat (high-value habitat consists of alfalfa, irrigated pasture and other hay crops), at least 18,862 acres of which would be managed in alfalfa, providing potential high-value habitat for loggerhead shrike. In addition, TRBL1.3 would ensure the protection and management of at least 4,600 acres of high and very high tricolored blackbird breeding foraging habitat in CZs 1, 2, 3, 4, 7, 8, or 11, the majority of which would also provide high-value habitat for loggerhead shrike. These biological goals and objectives would inform the near-term protection and restoration efforts and represent performance standards for considering the effectiveness of restoration actions for the species.

The acres of restoration and protection contained in the near-term Plan goals would satisfy the typical mitigation ratios that would be applied to the project-level effects of CM1 and habitat loss from other near-term impacts on high-value loggerhead shrike habitat, under the condition that impacts to grassland be compensated for at a ratio of either 1:1 restoration or 2:1 protection. In addition, of the 14,600 acres of cultivated lands that would be protected in the near-term, sufficient acreage would need to be managed in irrigated pasture or grain and hay such that the near-term impacts to high-value cultivated lands are compensated at a ratio of 2:1. Mitigation Measure BIO-138, *Compensate for loss of high-value loggerhead shrike habitat,* would be available to address the potential adverse effect of near-term habitat loss. The compensation for the loss of low-value loggerhead shrike habitat from near-term impacts would be slightly less than the typical ratio of 1:1 protection. However, the management and enhancement of cultivated lands including insect prey enhancement through CM3 and CM11, would compensate for any potential adverse effect from low-value foraging habitat loss on loggerhead shrike.

The Plan also includes commitments to implement AMM1 *Worker Awareness Training, AMM2 Construction Best Management Practices and Monitoring, AMM3 Stormwater Pollution Prevention Plan, AMM4 Erosion and Sediment Control Plan, AMM5 Spill Prevention, Containment, and Countermeasure Plan, AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan, and AMM7 Barge Operations Plan*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas and disposal sites. The AMMs are described in detail in BDCP Appendix 3.C. Loggerhead shrike are not covered species under the BDCP and in order to have a less than adverse effect on individuals, preconstruction surveys for noncovered avian species would be required to ensure that nests are detected and avoided. Mitigation Measure BIO-75, *Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds*, would be available to address this potential adverse effect.

Late Long-Term Timeframe

Alternative 4 as a whole would result in the permanent loss of and temporary effects on 48,110 acres of modeled loggerhead shrike habitat (consisting of 28,081 acres of high-value habitat) during the term of the Plan. The locations of these losses are described above in the analyses of individual conservation measures. The Plan includes a commitment to protect 8,000 acres and restore 2,000 acres of grassland natural community in CZs 1, 2, 4, 5, 7, 8, and 11 and to restore 72 acres of alkali seasonal wetland complex. In addition, 45,405 acres of cultivated lands would be protected (a large proportion of which would be managed as foraging habitat for covered species and would be expected to also benefit the shrike), and 150 acres of alkali seasonal wetland complex would be protected. The protection and restoration of grasslands would be part of a contiguous matrix of grassland, alkali seasonal wetland, and vernal pool natural communities which would expand habitat for loggerhead shrike and reduce the effects of current levels of habitat fragmentation, as the species prefers large open grassland habitats. Under *CM3 Natural Communities Protection and*

Restoration, and *CM11 Natural Communities Enhancement and Management*, small mammal and insect prey populations would be increased on protected grassland and cultivated lands, enhancing the foraging value of these natural communities for the shrike. In addition, there is a commitment in the plan (Objective CLNC1.3) to maintain and protect small patches of trees and shrubs within cultivated lands that could provide breeding habitat for the species. Species specific goals and objectives would also benefit loggerhead shrike. These include SH1.1 which commits to managing at least 36,725 acres (out of the 45,405 acres of protected cultivated lands) for Swainson's hawk foraging habitat (high-value habitat consists of alfalfa, irrigated pasture and other hay crops), at least 18,862 acres of which would be managed in alfalfa, providing potential high-value habitat for loggerhead shrike. In addition, TRBL1.3 would ensure the protection and management of at least 4,600 acres of high and very high tricolored blackbird breeding foraging habitat in CZs 1, 2, 3, 4, 7, 8, or 11, the majority of which would also provide high-value habitat for loggerhead shrike.

The loss of loggerhead shrike habitat associated with Alternative 4 would represent an adverse effect as a result of habitat modification of special-status species and potential for mortality in the absence of other conservation actions. Loggerhead shrike is not covered species under the BDCP and in order to have a less than adverse effect on individuals, preconstruction surveys for noncovered avian species would be required to ensure that nests are detected and avoided. With habitat protection and restoration associated with CM3, CM8, CM9, and CM11, guided by biological goals and objectives and AMM1–AMM7, which would be in place throughout the time period any construction activity would be occurring, and the implementation of Mitigation Measure BIO-75, the effects of habitat loss and potential mortality under Alternative 4 on for loggerhead shrike would not be adverse under NEPA.

CEQA Conclusion: Alternative 4 (CM1–CM18) would have both temporary and permanent impacts on for loggerhead shrike and their modeled habitat and operation of construction equipment could disturb individuals, if present in the study area.

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the impacts of construction would be less than significant. The Plan would remove 11,536 acres of modeled (7,512 acres of high-value, 4,024 acres of low-value) habitat for loggerhead shrike in the study area in the near-term. These impacts would result from the construction of the water conveyance facilities (CM1, 2,196 acres high-value habitat, 2,150 acres low-value habitat), and implementing other conservation measures (*CM2 Yolo Bypass Fisheries Enhancement*, *CM4 Tidal Natural Communities Restoration*, *CM5 Seasonally Inundated Floodplain Restoration*, *CM7 Riparian Natural Community Restoration*, *CM8 Grassland Natural Community Restoration*, *CM9 Vernal Pool and Alkali Seasonal Wetland Complex Restoration*, *CM10 Nontidal Marsh Restoration*, and *CM18 Conservation Hatcheries*—5,316 acres high-value habitat and 1,874 acres low-value habitat).

Typical NEPA and CEQA project-level mitigation ratios for those natural communities affected by CM1 would be 0:1 for restoration/creation and 2:1 protection of high-value habitat, and 0:1 for restoration/creation and 1:1 protection of low-value habitat. Using these typical ratios would indicate that 4,392 acres of high-value habitat should be protected to mitigate for the CM1 losses of 2,196 acres of high-value loggerhead shrike habitat and that 2,150 acres of low-value habitat should be protected to mitigate for the CM1 losses of 2,150 acres of low-value habitat. The offsetting acreage would need to be 4,294 acres of protection of high-value habitat and 2,084 acres of protection of low-value habitat to mitigate for the CM1 losses of 2,147 acres of high-value habitat and 2,084 acres of low-value habitat if the east-west transmission line alignment was selected for Alternative 4. The near-term effects of other conservation actions would remove 5,316 acres of high-value habitat and 1,874 acres of low-value habitat therefore require 10,632 acres of protection of high-value shrike habitat and 1,874 protection of low-value habitat using the same typical NEPA and CEQA ratios (2:1 for protection of high-value habitat, 1:1 for protection of low-value habitat).

The BDCP has committed to near-term goals of protecting 2,000 acres and restoring 1,140 acres of grassland natural community in CZ 1, 2, 4, 5, 7, 8, and 11. In addition, 48 acres of alkali seasonal wetland complex restored, 14,600 acres of cultivated lands would be protected, and 120 acres of alkali seasonal wetland complex would be protected. The protection and restoration of grasslands would be part of a contiguous matrix of grassland, alkali seasonal wetland, and vernal pool natural communities which would expand habitat for loggerhead shrike and reduce the effects of current levels of habitat fragmentation. In addition, the protection of 14,600 acres of cultivated lands would benefit loggerhead shrike. Under *CM3 Natural Communities Protection and Restoration*, and *CM11 Natural Communities Enhancement and Management*, small mammal and insect prey populations would be increased on protected grassland and cultivated lands, enhancing the foraging value of these natural communities for the shrike. In addition, there is a commitment in the plan (Objective CLNC1.3) to maintain and protect small patches of trees and shrubs within cultivated lands that could provide breeding habitat for the species. Species specific goals and objectives would also benefit loggerhead shrike. These include SH1.1 which commits to managing at least 36,725 acres (out of the 45,405 acres of protected cultivated lands) for Swainson's hawk foraging habitat (high-value habitat consists of alfalfa, irrigated pasture and other hay crops), at least 18,862 acres of which would be managed in alfalfa, providing potential high-value habitat for loggerhead shrike. In addition, TRBL1.3 would ensure the protection and management of at least 4,600 acres of high and very high tricolored blackbird breeding foraging habitat in CZs 1, 2, 3, 4, 7, 8, or 11, the majority of which would also provide high-value habitat for loggerhead shrike. These biological goals and objectives would inform the near-term protection and restoration efforts and represent performance standards for considering the effectiveness of restoration actions for the species.

The acres of restoration and protection contained in the near-term Plan goals would satisfy the typical mitigation ratios that would be applied to the project-level effects of CM1 and habitat loss from other near-term impacts on high-value loggerhead shrike habitat, under the condition that impacts to grassland be compensated for at a ratio of either 1:1 restoration or 2:1 protection. In addition, of the 14,600 acres of cultivated lands that would be protected in the near-term, sufficient acreage would need to be managed in irrigated pasture or grain and hay such that the near-term impacts to high-value cultivated lands are compensated at a ratio of 2:1. Mitigation Measure BIO-138, *Compensate for loss of high-value loggerhead shrike habitat*, would be available to address the potential adverse effect of near-term habitat loss, and reduce it to a less-than-significant impact. The compensation for the loss of low-value loggerhead shrike habitat from near-term impacts would be slightly less than the typical ratio of 1:1 protection. However, the management and enhancement of cultivated lands including insect prey enhancement through CM3 and CM11, would compensate for any potential adverse effect from low-value foraging habitat loss on loggerhead shrike.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training, AMM2 Construction Best Management Practices and Monitoring, AMM3 Stormwater Pollution Prevention Plan, AMM4 Erosion and Sediment Control Plan, AMM5 Spill Prevention, Containment, and Countermeasure Plan, AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan*, and *AMM7*

Barge Operations Plan. All of these AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas and disposal sites. The AMMs are described in detail in BDCP Appendix 3.C. Loggerhead shrike are not covered species under the BDCP and in order to have a less than adverse effect on individuals, preconstruction surveys for noncovered avian species would be required to ensure that nests are detected and avoided. The implementation of Mitigation Measure BIO-75, *Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds*, would reduce potential adverse effects on nesting loggerhead shrike to a less-than-significant level.

Late Long-Term Timeframe

Alternative 4 as a whole would result in the permanent loss of and temporary effects on 48,110 acres of modeled loggerhead shrike habitat (consisting of 28,081 acres of high-value habitat) during the term of the Plan. The locations of these losses are described above in the analyses of individual conservation measures. The Plan includes a commitment to protect 8,000 acres and restore 2,000 acres of grassland natural community in CZs 1, 2, 4, 5, 7, 8, and 11 and to restore 72 acres of alkali seasonal wetland complex. In addition, 45,405 acres of cultivated lands would be protected (a large proportion of which would be managed as foraging habitat for covered species and would be expected to also benefit the shrike), and 150 acres of alkali seasonal wetland complex would be protected. The protection and restoration of grasslands would be part of a contiguous matrix of grassland, alkali seasonal wetland, and vernal pool natural communities which would expand habitat for loggerhead shrike and reduce the effects of current levels of habitat fragmentation, as the species prefers large open grassland habitats. Under *CM3 Natural Communities Protection and Restoration*, and *CM11 Natural Communities Enhancement and Management*, small mammal and insect prey populations would be increased on protected grassland and cultivated lands, enhancing the foraging value of these natural communities for the shrike. In addition, there is a commitment in the plan (Objective CLNC1.3) to maintain and protect small patches of trees and shrubs within cultivated lands that could provide breeding habitat for the species. Species specific goals and objectives would also benefit loggerhead shrike. These include SH1.1 which commits to managing at least 36,725 acres (out of the 45,405 acres of protected cultivated lands) for Swainson's hawk foraging habitat (high-value habitat consists of alfalfa, irrigated pasture and other hay crops), at least 18,862 acres of which would be managed in alfalfa, providing potential high-value habitat for loggerhead shrike. In addition, TRBL1.3 would ensure the protection and management of at least 4,600 acres of high- and very high-value tricolored blackbird breeding foraging habitat in CZs 1, 2, 3, 4, 7, 8, or 11, the majority of which would also provide high-value habitat for loggerhead shrike.

Considering these protection and restoration provisions, which would provide acreages of new high-value or enhanced habitat in amounts suitable to compensate for habitats lost to construction and restoration activities, and with the implementation of AMM1–AMM7, and Mitigation Measure BIO-75, the loss of habitat or direct mortality through implementation of Alternative 4 would not result in a substantial adverse effect through habitat modifications and would not substantially reduce the number or restrict the range of either species. Therefore, the loss of habitat or potential mortality under this alternative would have a less-than-significant impact on loggerhead shrike.

Mitigation Measure BIO-75: Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds

See Mitigation Measure BIO-75 under Impact BIO-75.

Mitigation Measure BIO-138: Compensate for loss of high-value loggerhead shrike habitat

Impacts on loggerhead shrike high-value grassland habitat must be compensated at a ratio of either 1:1 restoration or 2:1 protection. In addition, of the 14,600 acres of cultivated lands protected in the near-term, sufficient acres must be managed in irrigated pasture or grain and hay crops, such that the total acres of high-value cultivated lands impacted in the near-term are compensated at a ratio of 2:1 protection of equal-value habitat.

Impact BIO-139: Effects on loggerhead shrike associated with electrical transmission facilities

New transmission lines would increase the risk for bird-power line strikes, which could result in injury or mortality of loggerhead shrike. The risk for bird-power line strikes, would be minimized for lesser sandhill crane with the incorporation of *AMM20 Greater Sandhill Crane* into the BDCP. This measure would ensure that conductor and ground lines are fitted with flight diverters in compliance with the best available practices, such as those specified in the USFWS Avian Protection Guidelines and would further ensure no adverse effect from electrical transmission facilities.

CEQA Conclusion: New transmission lines would increase the risk for bird-power line strikes, which could result in injury or mortality of loggerhead shrike. With the incorporation of *AMM20 Greater Sandhill Crane* into the BDCP, new transmission lines would have a less-than-significant impact on loggerhead shrike.

Impact BIO-140: Indirect effects of plan implementation on loggerhead shrike

If loggerhead shrike were to nest in or adjacent to work areas, construction and subsequent maintenance-related noise and visual disturbances could mask calls, disrupt foraging and nesting behaviors, and reduce the functions of suitable nesting habitat for these species. Mitigation Measure BIO-75, *Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds*, would avoid the potential for adverse effects of construction-related activities on survival and productivity of nesting loggerhead shrike. The use of mechanical equipment during water conveyance facilities construction could cause the accidental release of petroleum or other contaminants that could affect loggerhead shrike in the surrounding habitat. The inadvertent discharge of sediment or excessive dust adjacent to suitable habitat could also have an adverse effect on the species. AMM1–AMM7, including *AMM2 Construction Best Management Practices and Monitoring* would minimize the likelihood of such spills and ensure that measures are in place to prevent runoff from the construction area and negative effects of dust on active nests.

CEQA Conclusion: Impacts of noise, the potential for hazardous spills, increased dust and sedimentation, and operations and maintenance of the water conveyance facilities would be less than significant with the implementation of Mitigation Measure BIO-75, *Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds*, and AMM1–AMM7.

Mitigation Measure BIO-75: Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds

See Mitigation Measure BIO-75 under Impact BIO-75.

Impact BIO-141: Periodic effects of inundation on loggerhead shrike as a result of implementation of conservation components

Flooding of the Yolo Bypass from Fremont Weir operations (*CM2 Yolo Bypass Fisheries Enhancement*) would increase the frequency and duration of inundation on approximately 2,121–4,318 acres of modeled loggerhead shrike habitat (consisting of approximately 894–2,460 acres of high-value habitat; Table 12-4-50).

Based on hypothetical footprints, implementation of *CM5 Seasonally Inundated Floodplain Restoration*, could result in the periodic inundation of up to approximately 7,845 acres of modeled habitat (Table 12-4-50), the majority of which would be pasture and other cultivated lands.

Reduced foraging habitat availability may be expected during the fledgling period of the nesting season due to periodic inundation. However, inundation would occur during the non-breeding season and would not be expected to have an adverse effect on the species.

CEQA Conclusion: Periodic inundation of floodplains would not have a significant impact on loggerhead shrike because inundation is expected to occur prior to the breeding season.

Song Sparrow "Modesto" Population

The Modesto song sparrow is common and ubiquitous throughout the Plan area, occupying almost all wetland, riparian, and scrub habitats, as well as most agricultural habitats along associated drains. Construction and restoration associated with Alternative 4 conservation measures would result in both temporary and permanent removal of managed wetlands, tidal freshwater emergent, nontidal freshwater emergent, and valley/foothill riparian vegetation communities in the quantities indicated in Table 12-4-51. However, BDCP activities are expected to have little impact on the population. Full implementation of Alternative 4 would restore or create 5000 acres of valley/foothill riparian natural communities, 320 acres of managed wetland, 55,000 acres of tidal natural communities, and 1,200 acres of nontidal marsh. In addition, 750 acres of valley/foothill riparian, 6,500 acres of managed wetlands, and 25 acres of nontidal marsh would be protected (Table 12-4-51). As explained below, with the restoration or protection of these amounts of habitat, impacts on Modesto song sparrow would not be adverse for NEPA purposes and would be less than significant for CEQA purposes.

Table 12-4-51. Changes in Modesto Song Sparrow Modeled Habitat Associated with Alternative 4 (acres)[a]

	Conservation Measure[b]	Habitat Type	Permanent		Temporary		Periodic[d]	
			NT	LLT	NT	LLT	Yolo	Floodplain
Habitat Affected[c]	CM1		60	60	38	38	NA	NA
	Total Impacts CM1		**60**	**60**	**38**	**38**		
	CM2–CM18		5,356	13,739	192	228	742–2,263	284
	Total Impacts CM2–CM18		**5,356**	**13,739**	**192**	**228**	742–2,263	284
	TOTAL IMPACTS		**5,416**	**13,799**	**230**	**266**	**742–2,263**	**284**
	CM7 riparian		800	5,000	NA	NA	NA	NA
	CM3 managed wetland		320	320	NA	NA	NA	NA
	CM4 tidal wetland		15,300	55,000	NA	NA	NA	NA
	CM10 nontidal marsh		400	1,200	NA	NA	NA	NA

	Total Restoration/Creation	**16,820**	**61,520**				
Habitat Protected[e]	CM3 riparian	750	NA	NA	NA	NA	NA
	CM3 managed wetlands	3,200	6,500	NA	NA	NA	NA
	CM3 nontidal marsh	25	50	NA	NA	NA	NA
	Total Protection	**4,000**	**6,525**				

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late long-term timeframes.

[b] See discussion below for a description of applicable CMs.

[c] LLT acreages are a summation of effects that would occur in the near-term, early long-term and late long-term timeframes. The LLT acreages represent the total amount of habitat that would be affected over the 50-year life of the BDCP and do not reflect habitat increases that would result from restoration, creation and protection activities.

[d] Periodic effects were estimated for the late long-term only. Yolo periodic impacts are presented as a range based on different flow regimes at the proposed notch in Fremont Weir.

[e] Restored/created and protected habitat acreages represent planned conservation activities that would be implemented over the lifetime of the BDCP (see BDCP Chapter 3, *Conservation Strategy*, for specifics).

NT = near-term

LLT = late long-term

NA = not applicable

Impact BIO-142: Loss or conversion of habitat for and direct mortality of Modesto song sparrow

Alternative 4 conservation measures would result in the combined permanent and temporary loss of up to 14,065 acres of modeled habitat for Modesto song sparrow (of which 13,799 acres would be a permanent loss and 266 acres would be a temporary loss of habitat, Table 12-4-51). Conservation measures that would result in these losses are conveyance facilities and transmission line construction, and establishment and use of borrow and spoil areas (CM1), Yolo Bypass improvements(CM2), tidal habitat restoration (CM4), and floodplain restoration (CM5), and riparian habitat restoration (CM7). Habitat enhancement and management activities (CM11), which include ground disturbance or removal of nonnative vegetation, could result in local adverse habitat effects. In addition, maintenance activities associated with the long-term operation of the water conveyance facilities and other BDCP physical facilities could degrade or eliminate Modesto song sparrow modeled habitat. Each of these individual activities is described below. A summary statement of the combined impacts and NEPA and CEQA conclusions follows the individual conservation measure discussions.

- *CM1 Water Facilities and Operation:* Construction of Alternative 4 conveyance facilities would result in the combined permanent and temporary loss of up to 98 acres of modeled Modesto song sparrow habitat (60 acres of permanent loss, 38 acres of temporary loss) from CZs 3-6 and CZ 8. Refer to the Terrestrial Biology Map Book for a detailed view of Alternative 4 construction locations. Construction of the water conveyance facilities would occur in the near-term timeframe.

  There would be an 2-acre increase in the temporary loss of Modesto song sparrow habitat associated with the construction of the east-west transmission line for the Alternative 4 water conveyance facilities rather than the north-south transmission line.

- *CM2 Yolo Bypass Fisheries Enhancement:* Construction of the Yolo bypass fisheries enhancement would permanently remove 258 acres of modeled Modesto song sparrow habitat in the Yolo Bypass in CZ 2. In addition, 192 acres of grassland habitat would be temporarily removed. These losses would occur in the near-term timeframe and primarily consist of valley/foothill riparian natural community and managed wetland.
- *CM4 Tidal Natural Communities Restoration:* Tidal habitat restoration site preparation and inundation would result in the conversion of an estimated 13,438 acres of modeled Modesto song sparrow habitat from managed wetlands to tidal natural communities. Approximately 55,000 acres of tidal natural communities would be restored under CM4, increasing habitat for Modesto song sparrow.
- *CM5 Seasonally Inundated Floodplain Restoration:* Construction of setback levees to restore seasonally inundated floodplain (CM5) and riparian restoration activities (CM7) would permanently and temporarily remove approximately 79 acres of modeled Modesto song sparrow habitat (43 permanent, 36 temporary). These losses would be expected to occur along the San Joaquin River and other major waterways in CZ 7. The BDCP is expected to restore approximately 5,000 acres of valley/foothill riparian natural community. These lands would be managed as a mosaic of seral stages, age classes, and plant heights, some of which would provide suitable nesting habitat for Modesto song sparrow.
- *CM6 Channel Margin Enhancement:* Approximately 37 acres of valley/foothill riparian habitat are expected to be restored as a component of channel margin enhancement actions along 20 miles of river and slough channels in the Delta. Another 37 acres of riparian habitat would be restored if 20 more miles of channel margin were enhanced under adaptive management. Some of the restored riparian habitat in the channel margin is expected to support nesting habitat for Modesto song sparrow.
- *CM11 Natural Communities Enhancement and Management:* A variety of habitat management actions included in *CM11 Natural Communities Enhancement and Management* that are designed to enhance wildlife values in restored or protected habitats could result in localized ground disturbances that could temporarily remove small amounts of modeled habitat. Ground-disturbing activities, such as removal of nonnative vegetation and road and other infrastructure maintenance activities, would be expected to have minor adverse effects on available habitat and would be expected to result in overall improvements to and maintenance of habitat values over the term of the BDCP.

  Habitat management- and enhancement-related activities could affect Modesto song sparrow nests. If either species were to nest in the vicinity of a worksite, equipment operation could destroy nests, and noise and visual disturbances could lead to their abandonment, resulting in mortality of eggs and nestlings. Mitigation Measure BIO-75, *Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds*, would be available to address these potential adverse effects.
- Operations and Maintenance: Postconstruction operation and maintenance of the above-ground water conveyance facilities and restoration infrastructure could result in ongoing but periodic disturbances that could affect Modesto song sparrow use of the surrounding habitat. Maintenance activities would include vegetation management, levee and structure repair, and re-grading of roads and permanent work areas. These effects, however, would be reduced by AMMs, Mitigation Measures, and conservation actions as described below.

- Injury and Direct Mortality: Construction-related activities would not be expected to result in direct mortality of adult or fledged Modesto song sparrow if they were present in the Plan Area, because they would be expected to avoid contact with construction and other equipment. If either species were to nest in the construction area, construction-related activities, including equipment operation, noise and visual disturbances could destroy nests or lead to their abandonment, resulting in mortality of eggs and nestlings. Mitigation Measure BIO-75 would be available to address these potential adverse effects.

The following paragraphs summarize the combined effects discussed above and describe other BDCP conservation actions that offset or avoid these effects. NEPA and CEQA impact conclusions are also included.

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the effects of construction would not be adverse under NEPA and would be less than significant under CEQA. The Plan would remove 5,646 acres of modeled (5,416 permanent, 230 temporary) habitat for Modesto song sparrow in the study area in the near-term. These effects would result from the construction of the water conveyance facilities (CM1, 98 acres), and implementing other conservation measures (*CM2 Yolo Bypass Fisheries Enhancement*, *CM4 Tidal Natural Communities Restoration*, *CM5 Seasonally Inundated Floodplain Restoration*, and *CM7 Riparian Natural Community Restoration*—5,548 acres).

Typical NEPA and CEQA project-level mitigation ratios for those natural communities affected by CM1 would be 1:1 for restoration/creation and 1:1 protection of habitat. Using these typical ratios would indicate that 98 acres should be restored/created and 98 acres should be protected to mitigate for the CM1 losses of 98 acres of Modesto song sparrow habitat. The offsetting acreage would need to be 100 acres each of restoration and protection if the east-west transmission line alignment was selected for Alternative 4. The near-term effects of other conservation actions would remove 5,548 acres of modeled habitat, and therefore require 5,548 acres of restoration/creation and 5,548 acres of protection of Modesto song sparrow habitat using the same typical NEPA and CEQA ratios (1:1 for restoration/creation and 1:1 for protection).

The BDCP has committed to near-term goals of protecting 750 acres and restoring 800 acres of valley/foothill riparian natural community. In addition, 320 acres of managed wetland would be restored and 3,200 acres would be protected in the near-term. Near-term conservation would also include 15,300 acres of restored tidal natural communities, 400 acres of restored nontidal marsh, and the protection of 50 acres of nontidal marsh. The Plan's biological goals and objectives (BDCP Chapter 3) further specify that of the 5,000 acres of riparian habitat restored/created in CZ 7 in the late long-term, at least 3,000 acres would be in wide bands and large, interconnected patches within restored seasonally inundated floodplain. Restoration would provide the large contiguous patches which would benefit Modesto song sparrow. A large fraction of the 5,000 acres of restored valley/foothill riparian woodland would be expected to provide suitable early- to mid-successional riparian vegetation for this species. Goals and objectives in The Plan for riparian restoration also include the restoration, maintenance and enhancement of structural heterogeneity with adequate vertical and horizontal overlap among vegetation components and over adjacent riverine channels, freshwater emergent wetlands, and grasslands. In addition, at least 1,000 acres of early- to mid-successional vegetation with a well-developed understory of dense shrubs would be maintained on restored seasonally inundated floodplain. The biological goals and objectives would inform the near-term protection and restoration efforts and represent performance standards for considering the effectiveness of restoration actions.

The acres of protection and restoration contained in the near-term Plan goals, in addition to the management and enhancement of valley/foothill riparian and wetland natural communities through CM3 and CM11 more than satisfy the typical mitigation ratios that would be applied to the project-level effects of CM1, and habitat loss from other near-term conservation actions, resulting in a less than adverse effect on Modesto song sparrow.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training, AMM2 Construction Best Management Practices and Monitoring, AMM3 Stormwater Pollution Prevention Plan, AMM4 Erosion and Sediment Control Plan, AMM5 Spill Prevention, Containment, and Countermeasure Plan, AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan*, and *AMM7 Barge Operations Plan*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas and disposal sites. The AMMs are described in detail in BDCP Appendix 3.C. Modesto song sparrow is not a covered species under the BDCP and in order to have a less than adverse effect on individuals, preconstruction surveys for noncovered avian species would be required to ensure that nests are detected and avoided. Mitigation Measure BIO-75, *Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds*, would be available to address this potential adverse effect.

Late Long-Term Timeframe

Alternative 4 as a whole would result in the permanent loss of and temporary effects on 14,065 acres of modeled Modesto song sparrow habitat during the term of the Plan. The locations of these losses are described above in the analyses of individual conservation measures. The Plan includes a commitment to protect 750 acres and restore 5,000 acres of valley/foothill riparian natural community; to restore 320 acres and protect 6,500 acres of managed wetland; and to restore 1,200 acres and protect 50 acres of nontidal marsh. In addition, 55,000 acres of tidal natural communities would be restored. Approximately 37 acres of valley/foothill riparian habitat would be restored as a component of channel margin enhancement actions (CM6) along 20 miles of river and slough channels in the Delta. Another 37 acres of riparian habitat would be restored if 20 more miles of channel margin were enhanced under adaptive management. Some of the restored riparian habitat in the channel margin would be expected to support nesting habitat for Modesto song sparrow.

The Plan's biological goals and objectives (BDCP Chapter 3) further specify that of the 5,000 acres of riparian habitat restored/created in CZ 7 in the late long-term, at least 3,000 acres would be in wide bands and large, interconnected patches within restored seasonally inundated floodplain. Restoration would provide the large contiguous patches which would benefit Modesto song sparrow. A large fraction of the 5,000 acres of restored valley/foothill riparian woodland would be expected to provide suitable early- to mid-successional riparian vegetation for this species. Goals and objectives in The Plan for riparian restoration also include the restoration, maintenance and enhancement of structural heterogeneity with adequate vertical and horizontal overlap among vegetation components and over adjacent riverine channels, freshwater emergent wetlands, and grasslands. In addition, at least 1,000 acres of early- to mid-successional vegetation with a well-developed understory of dense shrubs would be maintained on restored seasonally inundated floodplain.

The loss of Modesto song sparrow habitat associated with Alternative 4 would represent an adverse effect as a result of habitat modification of special-status species and potential for mortality in the absence of other conservation actions. Modesto song sparrow is not covered species under the BDCP and in order to have a less than adverse effect on individuals, preconstruction surveys for noncovered avian species would be required to ensure that nests are detected and avoided. With habitat protection and restoration associated with CM3, CM4, CM6, CM7, and CM11, guided by biological goals and objectives and AMM1–AMM7, which would be in place throughout the time period any construction activity would be occurring, and the implementation of Mitigation Measure BIO-75, the effects of habitat loss and potential mortality under Alternative 4 on for Modesto song sparrow would not be adverse under NEPA.

CEQA Conclusion: Alternative 4 (CM1–CM7 and CM11) would have both temporary and permanent impacts on for Modesto song sparrow and their modeled habitat and operation of construction equipment could disturb individuals, if present in the study area.

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the impacts of construction would be less than significant. The Plan would remove 5,646 acres of modeled (5,416 permanent, 230 temporary) habitat for Modesto song sparrow in the study area in the near-term. These impacts would result from the construction of the water conveyance facilities (CM1, 98 acres), and implementing other conservation measures (*CM2 Yolo Bypass Fisheries Enhancement*, *CM4 Tidal Natural Communities Restoration*, *CM5 Seasonally Inundated Floodplain Restoration*, and *CM7 Riparian Natural Community Restoration*—5,548 acres).

Typical NEPA and CEQA project-level mitigation ratios for those natural communities affected by CM1 would be 1:1 for restoration/creation and 1:1 protection of habitat. Using these typical ratios would indicate that 98 acres should be restored/created and 98 acres should be protected to mitigate for the CM1 losses of 98 acres of Modesto song sparrow habitat. The offsetting acreage would need to be 100 acres each of restoration and protection if the east-west transmission line alignment was selected for Alternative 4. The near-term effects of other conservation actions would remove 5,548 acres of modeled habitat, and therefore require 5,548 acres of restoration/creation and 5,548 acres of protection of Modesto song sparrow habitat using the same typical NEPA and CEQA ratios (1:1 for restoration/creation and 1:1 for protection).

The BDCP has committed to near-term goals of protecting 750 acres and restoring 800 acres of valley/foothill riparian natural community. In addition, 320 acres of managed wetland would be restored and 3,200 acres would be protected in the near-term. Near-term conservation would also include 15,300 acres of restored tidal natural communities, 400 acres of restored nontidal marsh, and the protection of 50 acres of nontidal marsh. The Plan's biological goals and objectives (BDCP Chapter 3) further specify that of the 5,000 acres of riparian habitat restored/created in CZ 7 in the late long-term, at least 3,000 acres would be in wide bands and large, interconnected patches within restored seasonally inundated floodplain. Restoration would provide the large contiguous patches which would benefit Modesto song sparrow. A large fraction of the 5,000 acres of restored valley/foothill riparian woodland would be expected to provide suitable early- to mid-successional riparian vegetation for this species. Goals and objectives in The Plan for riparian restoration also include the restoration, maintenance and enhancement of structural heterogeneity with adequate vertical and horizontal overlap among vegetation components and over adjacent riverine channels, freshwater emergent wetlands, and grasslands. In addition, at least 1,000 acres of early- to mid-successional vegetation with a well-developed understory of dense shrubs would be maintained on restored seasonally inundated floodplain. The biological goals and objectives would inform the near-term protection and restoration efforts and represent performance standards for considering the effectiveness of restoration actions.

The acres of protection and restoration contained in the near-term Plan goals, in addition to the management and enhancement of valley/foothill riparian and wetland natural communities through CM3 and CM11 more than satisfy the typical mitigation ratios that would be applied to the project-level effects of CM1, and habitat loss from other near-term conservation actions, resulting in a less-than-significant impact on Modesto song sparrow.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training, AMM2 Construction Best Management Practices and Monitoring, AMM3 Stormwater Pollution Prevention Plan, AMM4 Erosion and Sediment Control Plan, AMM5 Spill Prevention, Containment, and Countermeasure Plan, AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan, and AMM7 Barge Operations Plan*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas and disposal sites. The AMMs are described in detail in BDCP Appendix 3.C. Modesto song sparrow is not a covered species under the BDCP and in order to have a less than adverse effect on individuals, preconstruction surveys for noncovered avian species would be required to ensure that nests are detected and avoided. The implementation of Mitigation Measure BIO-75, *Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds*, would reduce potential adverse effects on nesting Modesto song sparrow to a less-than-significant level.

Late Long-Term Timeframe

Alternative 4 as a whole would result in the permanent loss of and temporary effects on 14,065 acres of modeled Modesto song sparrow habitat during the term of the Plan. The locations of these losses are described above in the analyses of individual conservation measures. The Plan includes a commitment to protect 750 acres and restore 5,000 acres of valley/foothill riparian natural community; to restore 320 acres and protect 6,500 acres of managed wetland; and to restore 1,200 acres and protect 50 acres of nontidal marsh. In addition, 55,000 acres of tidal natural communities would be restored. Approximately 37 acres of valley/foothill riparian habitat would be restored as a component of channel margin enhancement actions (CM6) along 20 miles of river and slough channels in the Delta. Another 37 acres of riparian habitat would be restored if 20 more miles of channel margin were enhanced under adaptive management. Some of the restored riparian habitat in the channel margin would be expected to support nesting habitat for Modesto song sparrow.

The Plan's biological goals and objectives (BDCP Chapter 3) further specify that of the 5,000 acres of riparian habitat restored/created in CZ 7 in the late long-term, at least 3,000 acres would be in wide bands and large, interconnected patches within restored seasonally inundated floodplain. Restoration would provide the large contiguous patches which would benefit Modesto song sparrow. A large fraction of the 5,000 acres of restored valley/foothill riparian woodland would be expected to provide suitable early- to mid-successional riparian vegetation for this species. Goals and objectives in The Plan for riparian restoration also include the restoration, maintenance and enhancement of structural heterogeneity with adequate vertical and horizontal overlap among vegetation components and over adjacent riverine channels, freshwater emergent wetlands, and grasslands. In addition, at least 1,000 acres of early- to mid-successional vegetation with a well-developed understory of dense shrubs would be maintained on restored seasonally inundated floodplain.

Considering these protection and restoration provisions, which would provide acreages of new high-value or enhanced habitat in amounts suitable to compensate for habitats lost to construction and restoration activities, and with the implementation of AMM1–AMM7, and Mitigation Measure BIO-75, the loss of habitat or direct mortality through implementation of Alternative 4 would not result in a substantial adverse effect through habitat modifications and would not substantially reduce the number or restrict the range of either species. Therefore, the loss of habitat or potential mortality under this alternative would have a less-than-significant impact on Modesto song sparrow.

Mitigation Measure BIO-75: Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds

See Mitigation Measure BIO-75 under Impact BIO-75.

Impact BIO-143: Effects on Modesto song sparrow associated with electrical transmission facilities

New transmission lines would increase the risk for bird-power line strikes, which could result in injury or mortality of Modesto song sparrow. The potential for this risk, however, is considered minimal based on the flight behaviors of the species; therefore, new power lines are not expected to have an adverse effect on the species.

CEQA Conclusion: New transmission lines are not expected to have a significant impact on Modesto song sparrow because of the flight behavior of the species.

Impact BIO-144: Indirect effects of plan implementation on Modesto song sparrow

Indirect construction-related effects: Noise and visual disturbances associated with construction-related activities could result in temporary disturbances that affect Modesto song sparrow use of modeled habitat. Indirect effects associated with construction include noise, dust, and visual disturbance caused by grading, filling, contouring, and other ground-disturbing operations. Construction-related noise and visual disturbances could disrupt nesting and foraging behaviors, and reduce the functions of suitable habitat which could result in an adverse effect on these species. Mitigation Measure BIO-75, *Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds*, would be available to minimize potential adverse effects to active nests. The use of mechanical equipment during water conveyance construction could cause the accidental release of petroleum or other contaminants that could affect these species or their prey in the surrounding habitat. AMM1–AMM7 including *AMM2 Construction Best Management Practices and Monitoring* would minimize the likelihood of such spills from occurring. The inadvertent discharge of sediment or excessive dust adjacent to Modesto song sparrow could also have a negative effect on these species. AMM1–AMM7 would ensure that measures are in place to prevent runoff from the construction area and the negative effects of dust on wildlife adjacent to work areas.

Methylmercury Exposure: Marsh (tidal and nontidal) and floodplain restoration have the potential to increase exposure to methylmercury. Mercury is transformed into the more bioavailable form of methylmercury in aquatic systems, especially areas subjected to regular wetting and drying such as tidal marshes and flood plains (Alpers et al. 2008). Thus, BDCP restoration activities that create newly inundated areas could increase bioavailability of mercury (see BDCP Chapter 3, *Conservation Strategy*, for details of restoration). Species sensitivity to methylmercury differs widely and there is a large amount of uncertainty with respect to species-specific effects. Increased methylmercury associated with natural community and floodplain restoration could indirectly affect Modesto song sparrow, via uptake in lower tropic levels (as described in the BDCP, Appendix 5.D, *Contaminants*).

In addition, the potential mobilization or creation of methylmercury within the Plan Area varies with site-specific conditions and would need to be assessed at the project level. Measures described in Chapter 3 of the BDCP, Section 3.4.13, *CM12 Methylmercury Management* include provisions for Project-specific Mercury Management Plans. Site-specific restoration plans that address the creation and mobilization of mercury, as well as monitoring and adaptive management as described in CM12 would be available to address the uncertainty of methylmercury levels in restored tidal marsh and potential impacts on Modesto song sparrow.

CEQA Conclusion: Indirect effects on Modesto song sparrow as a result of constructing the water conveyance facilities could have a significant impact on these species. The incorporation of AMM1–AMM7 into the BDCP and the implementation of Mitigation Measure BIO-75, *Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds*, would reduce this impact to a less-than-significant level. The implementation of tidal natural communities restoration or floodplain restoration could result in increased exposure of Modesto song sparrow to methylmercury. However, it is unknown what concentrations of methylmercury are harmful to the species. Site-specific restoration plans that address the creation and mobilization of mercury, as well as monitoring and adaptive management as described in *CM12 Methylmercury Management* would better inform potential impacts and address the uncertainty of methylmercury levels in restored tidal marsh in the study area.

Mitigation Measure BIO-75: Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds

See Mitigation Measure BIO-75 under Impact BIO-75.

Impact BIO-145: Periodic effects of inundation on Modesto song sparrow as a result of construction of conservation components

Flooding of the Yolo Bypass (CM2) would inundate 742–2,263 acres of modeled Modesto song sparrow habitat. However, inundation would occur during the non-breeding season. Reduced foraging habitat availability would be expected during the fledgling period of the nesting season due to periodic inundation.

Based on hypothetical floodplain restoration, construction of setback levees from seasonally inundated floodplain restoration (CM5) could result in periodic inundation of up to approximately 284 acres of Modesto song sparrow modeled habitat (Table 12-4-51).

The periodic inundation of the Yolo Bypass (CM2) and of seasonal floodplains (CM5) is expected to restore a more natural flood regime in support of wetland and riparian vegetation types that support Modesto song sparrow habitat, but may reduce the availability of nesting habitat during years when flooding extends into the nesting season (past March).

CEQA Conclusion: Periodic effects of inundation would have a less-than-significant impact on Modesto song sparrow because inundation would be expected to primarily occur during the non-breeding season.

Bank Swallow

Bank swallows nest in colonies along rivers, streams, or other water and require fine textured sandy soils in vertical banks to create their burrows. There is little suitable habitat for bank swallow in the Plan Area because of levee revetment for bank stabilization. However, there are three occurrences of bank swallow: two in CZ 2 north of Fremont Weir, and one in CZ 5 on Brannan Island, just west of Twitchell Island.

Construction and restoration associated with Alternative 4 conservation measures would not result in any direct loss of modeled habitat for bank swallow. However, indirect effects of noise and visual disturbance from CM2 Yolo Bypass Fisheries Enhancements and *CM4 Tidal Natural Communities Restoration* could have impacts on bank swallow. In addition, there is uncertainty with respect to how water flows upstream of the Plan Area would affect bank swallow habitat. As explained below, impacts to bank swallow would not be adverse for NEPA purposes and would be less than significant for CEQA purposes with the implementation of mitigation measures to monitor colonies and address the uncertainty of upstream operations on the species.

Table 12-4-52. Changes in Bank Swallow Modeled Habitat Associated with Alternative 4 (acres)[a]

	Conservation Measure[b]	Habitat Type	Permanent		Temporary		Periodic[d]	
			NT	LLT	NT	LLT	Yolo	Floodplain
Habitat Affected[c]	CM1	Breeding	0	0	0	0	NA	NA
	Total Impacts CM1		**0**	**0**	**0**	**0**		
	CM2–CM18	Breeding	0	0	0	0	0	0
	Total Impacts CM2–CM18		**0**	**0**	**0**	**0**	**0**	**0**
	TOTAL IMPACTS		**0**	**0**	**0**	**0**	**0**	**0**
Habitat Restored/ Created[e]	**Total Restoration/Creation**		**0**	**0**	NA	NA	NA	NA
Habitat Protected[e]	**Total Protection**		**0**	**0**	NA	NA	NA	NA

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late long-term timeframes.

[b] See discussion below for a description of applicable CMs.

[c] LLT acreages are a summation of effects that would occur in the near-term, early long-term and late long-term timeframes. The LLT acreages represent the total amount of habitat that would be affected over the 50-year life of the BDCP and do not reflect habitat increases that would result from restoration, creation and protection activities.

[d] Periodic effects were estimated for the late long-term only. Yolo periodic impacts are presented as a range based on different flow regimes at the proposed notch in Fremont Weir.

[e] Restored/created and protected habitat acreages represent planned conservation activities that would be implemented over the lifetime of the BDCP (see BDCP Chapter 3, *Conservation Strategy*, for specifics).

NT = near-term

LLT = late long-term

NA = not applicable

Impact BIO-146: Indirect effects of the construction of conservation components on bank swallow

Noise and visual disturbances during restoration activities from *CM2 Yolo Bypass Fisheries Enhancement*, and *CM4 Tidal Natural Communities Restoration* including operation of earthmoving equipment and human activities at work sites, could result in temporary disturbances that cause bank swallow to abandon active nest burrows adjacent to construction areas. Bank swallow colonies with occupied burrows have been recorded in CZ 2 and CZ 5. and construction-related disturbances could result in an adverse effect on individuals. Various activities related to *CM11 Natural Communities Enhancement and Management* could also have indirect impacts on bank swallow.

CEQA Conclusion: Habitat management and enhancement activities could have a significant impact on bank swallow. Noise and visual disturbances could result in significant impacts to bank swallow if active colonies were present within 250 feet of work areas. Implementation of Mitigation Measure BIO-146, *Active bank swallow colonies shall be avoided and indirect effects on bank swallow will be minimized*, would reduce this to a less-than-significant impact.

Mitigation Measure BIO-146: Active bank swallow colonies shall be avoided and indirect effects on bank swallow will be minimized

To the extent practicable, construction of conservation components will not occur during the bank swallow nesting season (April through August). If construction activities cannot be avoided during nesting season, a qualified biologist will conduct pre-construction surveys to determine if active bank swallow nesting colonies are present within 250 feet of work areas. If no active nesting colonies are present, no further mitigation is required. If active nesting colonies are detected within 250 feet of a work area during preconstruction surveys, a no-impact buffer zone will be determined by a qualified biologist in conjunction with CDFW or the Bank Swallow TAC, and the biologist will monitor active nests until young have fledged. If the biologist determines that construction activities are disturbing the birds and nest failure is possible, CDFW will be notified and construction within the buffer zone may be halted.

Impact BIO-147: Upstream effects of reservoir and water conveyance facilities operations on bank swallow

Bank swallows are a riparian species that have evolved to deal with a dynamic system that changes with annual variation in variables such as rainfall, or late snowpack runoff. The primary threat to the species is loss of habitat. The population has become reduced due to loss of nesting habitat from revetments for levee stabilization. Because of this limited available habitat, it has become difficult for them to recover from high flow years (during the breeding season). The potential impacts of changes in upstream flows on bank swallows are flooding of active burrows and destruction of burrows from increased bank erosion. It can be inferred from Chapter 5, *Water Supply*, that the spring flows (March–May) under Alternative 4 would not be significantly greater than the No Action alternative. However, because of the complexity of variables that dictate suitable habitat for the species, there is uncertainty regarding the potential for and magnitude of upstream impacts on bank swallow from changes in operations. Soil type, high winter flows, and low spring flows all contribute to successful nesting of bank swallow. Even moderate changes in seasonal flows could have an adverse effect on breeding success for the species. Mitigation Measure BIO-147, *Monitor bank swallow colonies and evaluate winter and spring flows upstream of the Plan Area*, would be available to address the uncertainty of potential adverse upstream effects of operations on bank swallow.

CEQA Conclusion: It can be inferred from Chapter 5, *Water Supply*, that the spring flows (March-May) under Alternative 4 would not be significantly greater than the No Action alternative. However, there is uncertainty in the upstream impacts on bank swallow from changes in operations, as there are many variables that dictate suitable habitat for the species that cannot be clearly quantified, and seasonal changes in flow could increase or decrease suitable habitat for bank swallow depending on soil type and location of current colonies. Mitigation Measure BIO-147, *Monitor bank swallow colonies and evaluate winter and spring flows upstream of the Plan Area*, would address this uncertainty and further determine if additional mitigation is required for bank swallow.

Mitigation Measure BIO-147: Monitor bank swallow colonies and evaluate winter and spring flows upstream of the Plan Area.

Monitoring of existing colonies upstream of the Plan Area, and the collection of habitat suitability data including soil type, number of active burrows per colony, and height of average burrows would be required to address the uncertainty of the impact of upstream winter and spring flows on existing bank swallow habitat.

If impacts of upstream flows on bank swallow are identified, further mitigation may be required after consultation with CDFW and the Bank Swallow TAC. Possible mitigation could consist of conservation easements on currently occupied habitat or revetment removal projects to create habitat for bank swallow.

Yellow-Headed Blackbird

The habitat model used to assess impacts to yellow-headed blackbird includes breeding habitat and foraging habitat. Modeled breeding habitat includes tidal freshwater emergent wetland, other natural seasonal wetland, nontidal freshwater perennial emergent wetland, and managed wetland. Modeled non-breeding habitat for yellow-headed blackbird includes cultivated lands and noncultivated land cover types known to support abundant insect populations.

Construction and restoration associated with Alternative 4 conservation measures would result in both temporary and permanent losses of yellow-headed blackbird modeled habitat as indicated in Table 12-4-53. Full implementation of Alternative 4 would restore or create 320 acres of managed wetland, and 13,900 acres of tidal freshwater wetlands. In addition, 45,405 acres of cultivated lands would be protected, and a contiguous matrix of an additional 10,889 acres of non-breeding habitat would be conserved through grassland, vernal pool and alkali seasonal wetland complex restoration and protection. The protection of 6,500 acres of managed wetlands would also provide suitable breeding habitat for yellow-headed blackbird. As explained below, with the restoration or protection of these amounts of habitat, applicable AMMs, preconstruction surveys for noncovered avian species, and the implementation of no-disturbance buffers for nesting birds, impacts on yellow-headed blackbird would not be adverse for NEPA purposes and would be less than significant for CEQA purposes.

Table 12-4-53. Changes in Yellow-Headed Blackbird Modeled Habitat Associated with Alternative 4

	Conservation Measure[b]	Habitat Type	Permanent		Temporary		Periodic[d]	
			NT	LLT	NT	LLT	Yolo	Floodplain
Habitat	CM1	Breeding	11	11	13	13	NA	NA

Affected[c]		Non-breeding	1,355	1,355	388	388	NA	NA
	Total Impacts CM1		**1,366**	**1,366**	**401**	**401**		
	CM2–CM18	Breeding	4,830	12,886	43	44	691–2,171	19
		Non-breeding	3,758	23,108	0	491	368–1,476	3,364
	Total Impacts CM2–CM18		**8,588**	**36,024**	**43**	**535**	**1,329–3,647**	**3,383**
	TOTAL IMPACTS		**9,954**	**37,390**	**444**	**936**	**1,329–3,647**	**3,383**
	CM3 managed wetland		320	320	NA	NA	NA	NA
	CM4 tidal wetland		5,200	13,900	NA	NA	NA	NA
	CM3 alkali seasonal wetland		58	72	NA	NA	NA	NA
	CM8 grassland		1,140	2,000	NA	NA	NA	NA
	CM9 vernal pool complex		40	67	NA	NA	NA	NA
	Total Restoration/Creation		**6,758**	**16,359**				
Habitat Protected[e]	CM3 managed wetland		3,200	6,500	NA	NA	NA	NA
	CM3 alkali seasonal wetland		120	150	NA	NA	NA	NA
	CM3 vernal pool complex		400	600	NA	NA	NA	NA
	CM3 grassland		2,000	8,000	NA	NA	NA	NA
	CM3 cultivated lands (non-rice)		14,600	45,405	NA	NA	NA	NA
	CM3 cultivated lands (rice)		300	1,500	NA	NA	NA	NA
	Total Protection		**20,620**	**62,155**				

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late long-term timeframes.

[b] See discussion below for a description of applicable CMs.

[c] LLT acreages are a summation of effects that would occur in the near-term, early long-term and late long-term timeframes. The LLT acreages represent the total amount of habitat that would be affected over the 50-year life of the BDCP and do not reflect habitat increases that would result from restoration, creation and protection activities.

[d] Periodic effects were estimated for the late long-term only. Yolo periodic impacts are presented as a range based on different flow regimes at the proposed notch in Fremont Weir.

[e] Restored/created and protected habitat acreages represent planned conservation activities that would be implemented over the lifetime of the BDCP (see BDCP Chapter 3, *Conservation Strategy*, for specifics).

NT = near-term

LLT = late long-term

NA = not applicable

Impact BIO-148: Loss of habitat for and direct mortality of yellow-headed blackbird

Alternative 4 conservation measures would result in the combined permanent and temporary loss of up to 38,447 acres of suitable habitat for yellow-headed blackbird (Table 12-4-53). Conservation measures that would result in these losses are conveyance facilities and transmission line construction, and establishment and use of borrow and spoil areas (CM1), Yolo Bypass improvements (CM2), tidal habitat restoration (CM4), floodplain restoration (CM5), marsh restoration (CM10), and construction of conservation hatcheries (CM18). Habitat enhancement and management activities (CM11) which include ground disturbance or removal of nonnative vegetation could result in local adverse habitat effects. In addition, maintenance activities associated with the long-term operation of the water conveyance facilities and other BDCP physical facilities could degrade or eliminate yellow-headed blackbird suitable habitat. Each of these individual activities is described below. A summary statement of the combined impacts and NEPA and CEQA conclusions follows the individual conservation measure discussions.

- *CM1 Water Facilities and Operation:* Construction of Alternative 4 water conveyance facilities would result in the combined permanent and temporary loss of up to 1,767 acres of suitable yellow-headed blackbird habitat, composed of 24 acres of breeding habitat and 1,743 acres of non-breeding habitat (Table 12-22). Activities that would impact suitable Yellow-headed blackbird habitat consist of tunnel, forebay, and intake construction, temporary access roads, and construction of transmission lines. Impacts from CM1 would occur in the central delta in CZ 3, CZ 4, CZ 5, CZ 6, and CZ 8. Refer to the Terrestrial Biology Map Book for a detailed view of Alternative 4 construction locations.

  There would be an 39-acre decrease in the combined permanent and temporary loss of yellow-headed blackbird habitat (4-acre decrease in the loss of breeding habitat; 35-acre decrease in the loss of non-breeding habitat) associated with the construction of the east-west transmission line for the Alternative 4 water conveyance facilities rather than the north-south transmission line.

- *CM2 Yolo Bypass Fisheries Enhancement:* Construction of the Yolo bypass fisheries enhancement would result in the permanent removal of 29 acres of breeding habitat and 113 acres of non-breeding habitat for yellow-headed blackbird. In addition, CM2 would result in the temporary loss of 43 acres of breeding habitat for the species. Impacts from CM2 would primarily occur in the near-term timeframe.

- *CM4 Tidal Natural Communities Restoration*: Site preparation and inundation from CM4 would permanently remove or convert an estimated 4,801 acres of breeding habitat. In addition, 3,282 acres of non-breeding habitat would be lost or converted as a result of tidal restoration. However, the resulting 45,405 acres of tidal natural communities would also provide habitat for the species, 13,900 acres of which would be tidal freshwater natural communities providing breeding habitat for yellow-headed blackbird.

- *CM5 Seasonally Inundated Floodplain Restoration* and *CM7 Riparian Natural Community Restoration:* Construction of setback levees to restore seasonally inundated floodplain and riparian restoration actions (CM5) would permanently and temporarily remove approximately 2,477 acres of suitable yellow-headed blackbird habitat consisting of 2 acres of breeding habitat and 2,475 acres of non-breeding habitat.

- *CM8 Grassland Natural Community Restoration:* Restoration of grassland (CM8) is expected to be implemented on agricultural lands and would result in the conversion of 230 acres of yellow-headed blackbird agricultural foraging habitat to grassland foraging habitat in CZs 1, 8, and/or 11. If agricultural lands supporting higher value foraging habitat than the restored grassland were removed, there would be a loss of yellow-headed blackbird foraging habitat value. CM8 would result in the restoration of 2,000 acres of grassland foraging habitat in the Plan Area.

- *CM10 Nontidal Marsh Restoration:* Restoration and creation of nontidal freshwater marsh (CM10) would result in the permanent conversion of 133 acres of cultivated lands foraging habitat to nontidal marsh in CZ 2 and CZ 4. Yellow-headed blackbird nesting habitat may develop along the margins of restored nontidal marsh and restoration would also provide foraging habitat for the species.

- *CM11 Natural Communities Enhancement and Management:* Habitat management- and enhancement-related activities could disturb yellow-headed blackbird nests if they were present near work sites. A variety of habitat management actions included in *CM11 Natural Communities Enhancement and Management* that are designed to enhance wildlife values in BDCP-protected habitats may result in localized ground disturbances that could temporarily remove small amounts of yellow-headed blackbird habitat and reduce the functions of habitat until restoration is complete. Ground-disturbing activities, such as removal of nonnative vegetation and road and other infrastructure maintenance, would be expected to have minor effects on available yellow-headed blackbird habitat. These effects cannot be quantified, but are expected to be minimal and would be avoided and minimized by the AMMs listed below.
- Operations and Maintenance: Postconstruction operation and maintenance of the above-ground water conveyance facilities and restoration infrastructure could result in ongoing but periodic disturbances that could affect yellow-headed blackbird use of the surrounding habitat. Maintenance activities would include vegetation management, levee and structure repair, and re-grading of roads and permanent work areas. These effects, however, would be reduced by AMMs and conservation actions as described below.
- Injury and Direct Mortality: Construction-related activities would not be expected to result in direct mortality of adult or fledged yellow-headed blackbird if they were present in the Plan Area, because they would be expected to avoid contact with construction and other equipment.
- If yellow-headed blackbird were to nest in the construction area, construction-related activities, including equipment operation, noise and visual disturbances could destroy nests or lead to their abandonment, resulting in mortality of eggs and nestlings. Mitigation Measure BIO-75, *Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds*, would be available to address these potential adverse effects on yellow-headed blackbird.

The following paragraphs summarize the combined effects discussed above and describe other BDCP conservation actions that offset or avoid these effects. NEPA and CEQA impact conclusions are also included.

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the effects of construction would not be adverse under NEPA and would be less than significant under CEQA. The Plan would convert or remove 4,897 acres of breeding habitat and 5,501 acres of non-breeding habitat for yellow-headed blackbird in the study area in the near-term. These effects would result from the construction of the water conveyance facilities (CM1, 24 acres of breeding and 1,743 acres of non-breeding habitat), and implementing other conservation measures (*CM2 Yolo Bypass Fisheries Enhancement*, *CM4 Tidal Natural Communities Restoration*, *CM5 Seasonally Inundated Floodplain Restoration*, *CM8 Grassland Natural Community Restoration*, and *CM10 Nontidal Marsh Restoration*—4,873 acres of breeding and 3,758 acres of non-breeding habitat).

Typical NEPA and CEQA project-level mitigation ratios for those natural communities affected by CM1 would be 1:1 for restoration/creation and 1:1 protection of breeding and non-breeding habitat.

Using these typical ratios would indicate that 24 acres of breeding habitat should be restored/created and 24 acres should be protected to mitigate for the CM1 losses of yellow-headed blackbird breeding habitat. In addition, 1,743 acres of non-breeding habitat should be restored/created and 1,743 acres should be protected to mitigate for the CM1 losses of yellow-headed blackbird non-breeding foraging habitat. The offsetting acreage would need to be 20 acres each of restoration and protection of breeding habitat, and 1,708 acres each of restoration and protection of non-breeding habitat if the east-west transmission line alignment was selected for Alternative 4. The near-term effects of other conservation actions would require 4,873 acres each of restoration and protection of breeding habitat. Similarly, near-term effects of other conservation actions would require 3,758 acres each of restoration and protection of non-breeding habitat using the same typical NEPA and CEQA ratios (1:1 for restoration and 1:1 for protection of breeding and non-breeding habitat).

The BDCP has committed to near-term goals of restoring 5,200 acres of tidal freshwater wetlands, and 320 acres of managed wetlands in the study area that would provide potential yellow-headed blackbird nesting habitat. The 3,200 acres of managed wetland that would be protected in the near-term time period would also provide some suitable nesting habitat for the species. In addition, 3,758 acres of grasslands, alkali seasonal wetland and vernal pool natural communities (1,230 acres of restoration, 2,528 acres of protection) would be protected and restored as a contiguous mosaic of these natural communities and 14,600 acres of cultivated lands protection in the near-term would also provide breeding and nonbreeding foraging habitat for the species. The protection and restoration of grassland, alkali seasonal wetland, and vernal pool complex would provide improved foraging opportunities for yellow-headed blackbirds. Biological goals and objectives for covered species in the Plan (BDCP Chapter 3, *Conservation Strategy*) would also benefit noncovered species such as the yellow-headed blackbird. All protected habitat would be managed under *CM3 Natural Communities Protection and Restoration* and *CM11 Natural Communities Enhancement and Management* to increase insect prey populations on protected lands, enhancing the foraging value of these natural communities by implementing techniques such as grazing practices and avoiding the use of pesticides. These conservation actions would occur in the same timeframe as the construction and early restoration losses, thereby avoiding adverse effects on yellow-headed blackbird.

The Plan's biological goals and objectives for tricolored blackbird would also benefit yellow-headed blackbird foraging habitat as they further specify that cultivated lands protected for tricolored blackbird retain residual wetland, grassland patches, shrub stands, and herbaceous edge habitats which may provide suitable nesting, foraging or roosting habitat for yellow-headed blackbird. In addition, 20,500 acres of moderate-, high-, or very high-value cultivated lands would be conserved, 50% of which is high or very high foraging value. These conserved lands would benefit yellow-headed blackbird and the referenced foraging habitat value classes for tricolored blackbird are found in Table 12-4-37, under the tricolored blackbird impact analysis for Alternative 4. These biological goals and objectives would inform the near-term protection and restoration efforts and represent performance standards for considering the effectiveness of restoration actions.

The acres of protection and restoration contained in the near-term Plan goals, in addition to the detailed habitat value goals that would be applied to near-term conservation acres, are sufficient to satisfy the typical mitigation ratios that would be applied to the project-level effects of CM1 and habitat loss from other near-term conservation actions, resulting in a less than adverse effect on yellow-headed blackbird.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training, AMM2 Construction Best Management Practices and Monitoring, AMM3 Stormwater Pollution Prevention Plan, AMM4 Erosion and Sediment Control Plan, AMM5 Spill Prevention, Containment, and Countermeasure Plan, AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan*, and *AMM7 Barge Operations Plan*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas and disposal sites. The AMMs are described in detail in BDCP Appendix 3.C. Yellow-headed blackbird are not covered species under the BDCP and in order to have a less than adverse effect on individuals, preconstruction surveys for noncovered avian species would be required to ensure that nests are detected and avoided. Mitigation Measure BIO-75, *Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds*, would be available to address this potential adverse effect.

Late Long-Term Timeframe

Alternative 4 as a whole would result in the permanent loss of and temporary effects on 12,954 acres of breeding habitat and to 25,342 acres of non-breeding foraging habitat for yellow-headed blackbird during the term of the Plan. The locations of these losses are described above in the analyses of individual conservation measures. The Plan includes a commitment to restore 55,000 acres of tidal natural communities in the study area, 13,900 of which would provide freshwater nesting habitat for the species. In addition, 10,889 acres of grasslands, alkali seasonal wetland and vernal pool natural communities (2,139 acres of restoration, 8,750 acres of protection) would be protected and restored as a contiguous mosaic of these natural communities and 45,405 acres of cultivated lands protection in the near-term would also provide foraging habitat for yellow-headed blackbird (Table 12-4-53). A total of 6,500 acres of managed wetland would be protected and enhanced, some of which would be suitable habitat for yellow-headed blackbird. All protected habitat would be managed under *CM3 Natural Communities Protection and Restoration* and *CM11 Natural Communities Enhancement and Management* to increase insect prey populations on protected lands, enhancing the foraging value of these natural communities by implementing techniques such as grazing practices and avoiding the use of pesticides. The Plan's biological goals and objectives for tricolored blackbird would also benefit yellow-headed blackbird foraging habitat as they further specify that cultivated lands protected for tricolored blackbird retain residual wetland, grassland patches, shrub stands, and herbaceous edge habitats which may provide suitable nesting, foraging or roosting habitat for yellow-headed blackbird. In addition, 20,500 acres of moderate-, high-, or very high-value cultivated lands would be conserved, 50% of which is high or very high foraging value for the tricolored blackbird. These conserved lands would benefit yellow-headed blackbird and the referenced foraging habitat value classes for tricolored blackbird are found in Table 12-4-37, under the tricolored blackbird impact analysis for Alternative 4.

The loss of yellow-headed blackbird habitat associated with Alternative 4 would represent an adverse effect as a result of habitat modification of a special-status species and potential for direct mortality in the absence of other conservation actions. With habitat protection and restoration associated with CM3, CM4, CM8, CM9, CM10, and CM11, guided by biological goals and objectives and AMM1–AMM7, which would be in place throughout the time period any construction activity would be occurring, and the implementation of Mitigation Measure BIO-75, the effects of habitat loss and potential mortality under Alternative 4 on yellow-headed blackbird would not be adverse under NEPA.

CEQA Conclusion: Alternative 4 (CM1–CM11) would have both temporary and permanent impacts on yellow-headed blackbird and their suitable habitat and operation of construction equipment could injure or disturb individuals, if present in the study area.

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the impacts of construction would be less than significant. The Plan would convert or remove 4,897 acres of breeding habitat and 5,501 acres of non-breeding habitat for yellow-headed blackbird in the study area in the near-term. These impacts would result from the construction of the water conveyance facilities (CM1, 24 acres of breeding and 1,743 acres of non-breeding habitat), and implementing other conservation measures (*CM2 Yolo Bypass Fisheries Enhancement*, *CM4 Tidal Natural Communities Restoration*, *CM5 Seasonally Inundated Floodplain Restoration*, *CM8 Grassland Natural Community Restoration*, and *CM10 Nontidal Marsh Restoration*—4,873 acres of breeding and 3,758 acres of non-breeding habitat).

Typical NEPA and CEQA project-level mitigation ratios for those natural communities affected by CM1 would be 1:1 for restoration/creation and 1:1 protection of breeding and non-breeding habitat. Using these typical ratios would indicate that 24 acres of breeding habitat should be restored/created and 24 acres should be protected to mitigate for the CM1 losses of yellow-headed blackbird breeding habitat. In addition, 1,743 acres of non-breeding habitat should be restored/created and 1,743 acres should be protected to mitigate for the CM1 losses of yellow-headed blackbird non-breeding habitat. The offsetting acreage would need to be 20 acres each of restoration and protection of breeding habitat, and 1,708 acres each of restoration and protection of non-breeding habitat if the east-west transmission line alignment was selected for Alternative 4. The near-term effects of other conservation actions would require 4,873 acres each of restoration and protection of breeding habitat. Similarly, near-term effects of other conservation actions would require 3,758 each of restoration and protection of non-breeding habitat using the same typical NEPA and CEQA ratios (1:1 for restoration and 1:1 for protection of breeding and non-breeding foraging habitat).

The BDCP has committed to near-term goals of restoring 5,200 acres of tidal freshwater wetlands, and 320 acres of managed wetlands in the study area that would provide potential yellow-headed blackbird nesting habitat. The 3,200 acres of managed wetland that would be protected in the near-term time period would also provide some suitable nesting habitat for the species. In addition, 3,758 acres of grasslands, alkali seasonal wetland and vernal pool natural communities (1,230 acres of restoration, 2,528 acres of protection) would be protected and restored as a contiguous mosaic of these natural communities and 14,600 acres of cultivated lands protection in the near-term would also provide breeding and nonbreeding foraging habitat for the species. The protection and restoration of grassland, alkali seasonal wetland, and vernal pool complex would provide improved foraging opportunities for yellow-headed blackbirds. Biological goals and objectives for covered species in the Plan (BDCP Chapter 3, *Conservation Strategy*) would also benefit noncovered species such as the yellow-headed blackbird. Through CM3 and CM11, the protected matrix of grassland, vernal pool complex, and alkali seasonal wetland would be managed to increase insect prey through techniques such as grazing practices and avoiding the use of pesticides. These conservation actions would occur in the same timeframe as the construction and early restoration losses, thereby avoiding adverse effects on yellow-headed blackbird. The Plan's biological goals and objectives for tricolored blackbird would also benefit yellow-headed blackbird foraging habitat as they further specify that cultivated lands protected for tricolored blackbird retain residual wetland, grassland patches, shrub stands, and herbaceous edge habitats which may provide suitable nesting, foraging or roosting habitat for yellow-headed blackbird. In addition, 20,500 acres of moderate-, high-, or very high-value cultivated lands would be conserved, 50% of which is high or very high foraging value. These conserved lands would benefit yellow-headed blackbird and the referenced foraging habitat value classes for tricolored blackbird are found in Table 12-4-37, under the tricolored blackbird impact analysis for Alternative 4. These biological goals and objectives would inform the near-term protection and restoration efforts and represent performance standards for considering the effectiveness of restoration actions.

The acres of protection and restoration contained in the near-term Plan goals, in addition to the detailed habitat value goals that would be applied to near-term conservation acres, are sufficient to satisfy the typical mitigation ratios that would be applied to the project-level effects of CM1 and habitat loss from other near-term conservation actions, resulting in a less-than-significant impact on yellow-headed blackbird.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training, AMM2 Construction Best Management Practices and Monitoring, AMM3 Stormwater Pollution Prevention Plan, AMM4 Erosion and Sediment Control Plan, AMM5 Spill Prevention, Containment, and Countermeasure Plan, AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan, AMM7 Barge Operations Plan and AMM18 Swainson's Hawk and White-Tailed Kite*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas and disposal sites. The AMMs are described in detail in BDCP Appendix 3.C. Yellow-headed blackbird are not covered species under the BDCP and in order to have a less than adverse effect on individuals, preconstruction surveys for noncovered avian species would be required to ensure that nests are detected and avoided. The implementation of Mitigation Measure BIO-75, *Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds*, would reduce potential adverse effects on nesting yellow-headed blackbird to a less-than-significant level.

Late Long-Term Timeframe

Alternative 4 as a whole would result in the permanent loss of and temporary effects on 12,954 acres of breeding habitat and to 25,342 acres of non-breeding foraging habitat for yellow-headed blackbird during the term of the Plan. The locations of these losses are described above in the analyses of individual conservation measures. The Plan includes a commitment to restore 55,000 acres of tidal natural communities in the study area, 13,900 of which would provide freshwater nesting habitat for the species. In addition, 10,889 acres of grasslands, alkali seasonal wetland and vernal pool natural communities (2,139 acres of restoration, 8,750 acres of protection) would be protected and restored as a contiguous mosaic of these natural communities and 45,405 acres of cultivated lands protection in the near-term would also provide foraging habitat for yellow-headed blackbird (Table 12-4-53). A total of 6,500 acres of managed wetland would be protected and enhanced, some of which would be suitable habitat for yellow-headed blackbird. All protected habitat would be managed under *CM3 Natural Communities Protection and Restoration* and *CM11 Natural Communities Enhancement and Management* to increase insect prey populations on protected lands, enhancing the foraging value of these natural communities by implementing techniques such as grazing practices and avoiding the use of pesticides. The Plan's biological goals and objectives for tricolored blackbird would also benefit yellow-headed blackbird foraging habitat as they further specify that cultivated lands protected for tricolored blackbird retain residual wetland, grassland patches, shrub stands, and herbaceous edge habitats which may provide suitable nesting, foraging or roosting habitat for yellow-headed blackbird. In addition, 20,500 acres of moderate-, high-, or very high-value cultivated lands would be conserved, 50% of which is high or very high foraging value. These conserved lands would benefit yellow-headed blackbird and the referenced foraging habitat value classes for tricolored blackbird are found in Table 12-4-37, under the tricolored blackbird impact analysis for Alternative 4.

Considering these protection and restoration provisions, which would provide acreages of new or enhanced habitat in amounts necessary to compensate for habitat lost to construction and restoration activities, and with the implementation of AMM1–AMM7, and Mitigation Measure BIO-75, the loss of habitat or direct mortality through implementation of Alternative 4 would not result in a substantial adverse effect through habitat modifications and would not substantially reduce the number or restrict the range of either species. Therefore, the loss of habitat or potential mortality under this alternative would have a less-than-significant impact on yellow-headed blackbird.

Mitigation Measure BIO-75: Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds

See Mitigation Measure BIO-75 under Impact BIO-75.

Impact BIO-149: Effects on yellow-headed blackbird associated with electrical transmission facilities

New transmission lines would increase the risk for bird-power line strikes, which could result in injury or mortality of yellow-headed blackbird. *AMM20 Greater Sandhill Crane* would minimize the risk for bird-power line strikes. This measure would ensure that conductor and ground lines are fitted with flight diverters in compliance with the best available practices, such as those specified in the USFWS Avian Protection Guidelines would further ensure electrical transmission facilities do not have adverse effects.

CEQA Conclusion: New transmission lines would increase the risk for bird-power line strikes, which could result in injury or mortality of yellow-headed blackbird. *AMM20 Greater Sandhill Crane*, would ensure that new transmission lines would have a less-than-significant impact on yellow-headed blackbird.

Impact BIO-150: Indirect effects of plan implementation on yellow-headed blackbird

Indirect construction-related effects: Noise and visual disturbances associated with construction-related activities could result in temporary disturbances that affect yellow-headed blackbird use of suitable habitat. Indirect effects associated with construction include noise, dust, and visual disturbance caused by grading, filling, contouring, and other ground-disturbing operations. Construction-related noise and visual disturbances could disrupt nesting and foraging behaviors, and reduce the functions of suitable habitat which could result in an adverse effect on these species. Mitigation Measure BIO-75, *Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds*, would be available to minimize potential adverse effects to active nests. The use of mechanical equipment during water conveyance construction could cause the accidental release of petroleum or other contaminants that could affect the species in the surrounding habitat. AMM1–AMM7 including *AMM2 Construction Best Management Practices and Monitoring* would minimize the likelihood of such spills from occurring. The inadvertent discharge of sediment or excessive dust adjacent to yellow-headed blackbird habitat could also have a negative effect on the species. AMM1–AMM7 would ensure that measures are in place to prevent runoff from the construction area and the negative effects of dust on wildlife adjacent to work areas.

Methylmercury Exposure: Covered activities have the potential to exacerbate bioaccumulation of mercury in avian species, including yellow-headed blackbird. Marsh (tidal and nontidal) and floodplain restoration have the potential to increase exposure to methylmercury. Mercury is transformed into the more bioavailable form of methylmercury in aquatic systems, especially areas subjected to regular wetting and drying such as tidal marshes and flood plains (Alpers et al. 2008). Thus, BDCP restoration activities that create newly inundated areas could increase bioavailability of mercury (see BDCP Chapter 3, *Conservation Strategy*, for details of restoration). Species sensitivity to methylmercury differs widely and there is a large amount of uncertainty with respect to species-specific effects. Increased methylmercury associated with natural community and floodplain restoration could indirectly affect yellow-headed blackbird, via uptake in lower tropic levels (as described in the BDCP, Appendix 5.D, *Contaminants*).

In addition, the potential mobilization or creation of methylmercury within the Plan Area varies with site-specific conditions and would need to be assessed at the project level. Measures described in Chapter 3 of the BDCP, Section 3.4.13, *CM12 Methylmercury Management* include provisions for Project-specific Mercury Management Plans. Site-specific restoration plans that address the creation and mobilization of mercury, as well as monitoring and adaptive management as described in CM12 would be available to address the uncertainty of methylmercury levels in restored tidal marsh and potential impacts on yellow-headed blackbird.

CEQA Conclusion: Indirect effects on yellow-headed blackbird as a result of constructing the water conveyance facilities could have a significant impact on these species. The incorporation of AMM1–AMM7 into the BDCP and the implementation of Mitigation Measure BIO-75, *Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds,* would reduce this impact to a less-than-significant level. The implementation of tidal natural communities restoration or floodplain restoration could result in increased exposure of yellow-headed blackbird to methylmercury. However, it is unknown what concentrations of methylmercury are harmful to this species. In addition, it is unlikely that breeding yellow-headed blackbird would be highly susceptible to methylmercury exposure because tidal wetlands are not expected to be a major foraging area for the species. Site-specific restoration plans that address the creation and mobilization of mercury, as well as monitoring and adaptive management as described in CM12 would better inform potential impacts and address the uncertainty of methylmercury levels in restored tidal marsh in the study area.

Mitigation Measure BIO-75: Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds

See Mitigation Measure BIO-75 under Impact BIO-75.

Impact BIO-151: Periodic effects of inundation of yellow-headed blackbird nesting habitat as a result of implementation of conservation components

Flooding of the Yolo Bypass (CM2) would inundate 691–2,171 acres of breeding habitat and 368–1,476 acres of foraging habitat (Table 12-4-37). Based on hypothetical floodplain restoration, construction of setback levees for *CM5 Seasonally Inundated Floodplain Restoration* could result in periodic inundation of approximately 19 acres of breeding habitat and 3,364 acres of nonbreeding habitat (Table 12-4-37) resulting in the temporary loss of these habitats. Foraging yellow-headed blackbirds would be expected to move to adjacent suitable foraging habitat when the bypass is inundated, as they do under the current flooding regime. However, this inundation could reduce the availability of nesting habitat during years when flooding extends into the nesting season (past March).

The periodic inundation of the Yolo Bypass (CM2) and of other floodplains (CM5) is expected to restore a more natural flood regime in support of wetland and riparian vegetation types that support nesting habitat. There would be no expected adverse effect on yellow-headed blackbird.

CEQA Conclusion: Implementation of CM2 and CM5 would result in periodic inundation of nesting and foraging habitat for yellow-headed blackbird. Periodic inundation would have a less-than-significant impact on tricolored blackbird because inundation is expected to take place outside of the breeding season, and although foraging habitat would be temporarily unavailable, birds would be expected to move to adjacent foraging habitat.

Riparian Brush Rabbit

The habitat model used to assess effects on the riparian brush rabbit consists of 38 vegetation associations within the valley/foothill riparian natural community and adjacent grasslands. The vegetation associations were selected based on a review of understory and overstory composition from Hickson and Keeler-Wolf (2007) and species habitat requirements.

Just until recently, the only known naturally occurring populations of riparian brush rabbits were confined to Caswell Memorial State Park (MSP), a 258-acre park supporting riparian oak woodland on the Stanislaus River immediately southeast of the study area, and in the south Delta southwest of Lathrop, which is within the study area (Williams and Basey 1986; Williams et al. 2002) (Figure 12-46). On October 11, 2012 a single female riparian brush rabbit was captured near Durham Ferry Road in riparian habitat along the San Joaquin River between Caswell MSP and Lathrop (Bradbury pers. comm.). The is only the 2nd naturally occurring population documented outside of Caswell MSP. Factors considered in assessing the value of adversely affected habitat for riparian brush rabbit, to the extent information was available, included size and degree of isolation of habitat patches, proximity to recorded species occurrences, and adjacency to conserved lands.

Construction and restoration associated with Alternative 4 conservation measures would result in both temporary and permanent losses of riparian brush rabbit modeled habitat as indicated in Table 12-4-54. Implementation of Alternative 4 would result in an overall benefit to riparian brush rabbit within the study area through protection and restoration of its habitat. The BDCP would restore 5,000 acres of riparian habitat and protect at least 750 acres of valley/foothill riparian natural community, a portion of which is expected to consist of suitable riparian brush rabbit habitat. A substantial portion of this is expected to provide high-value riparian habitat for the riparian brush rabbit without implementing site-specific enhancement actions. Assuming the restored and protected riparian natural community would provide suitable riparian brush rabbit habitat proportional to the amount that exists within this natural community in the Plan Area (16% of the valley foothill riparian natural community in the Plan Area is modeled riparian brush rabbit habitat), an estimated 798 acres of suitable riparian habitat would be restored (5,000 acres X 16%) and 200 acres of suitable habitat would be protected (750 acres X 16%)(Table 12-4-54). The actual increase in available and protected acres is expected to be substantially greater because of the large overall extent of riparian restoration under the BDCP and the likely large number of patches of rabbit habitat that would establish naturally within restored areas. The restoration and management of riparian brush rabbit habitat is expected to provide conditions favorable for increasing the species' abundance and distribution within the study area. Therefore, Alternative 4 impacts on riparian brush rabbit would not be adverse for NEPA purposes and would be less than significant under CEQA.

Table 12-4-54. Changes in Riparian Brush Rabbit Modeled Habitat Associated with Alternative 4 (acres)[a]

	Conservation Measure[b]	Habitat Type	Permanent		Temporary		Periodic[d]	
			NT	LLT	NT	LLT	Yolo	Floodplain
Habitat Affected[c]	CM1	Riparian	7	7	1	1	NA	NA
		Grassland	150	150	30	30	NA	NA
	Total Impacts CM1		**157**	**157**	**31**	**31**		
	CM2–CM18	Riparian	0	62	0	35	0	264
		Grassland	0	44	0	20	0	423
	Total Impacts CM2–CM18		**0**	**106**	**0**	**55**	**0**	**687**
	TOTAL IMPACTS		**157**	**263**	**31**	**86**	**0**	**687**
Habitat Restored/ Created[e]	CM7: Riparian		300	798	NA	NA	NA	NA
	CM8: Grassland		UNK	UNK				
	Total Restoration/Creation		**300**	**798**	**NA**	**NA**	**NA**	**NA**
Habitat Protected[e]	CM3: Riparian		200	200	NA	NA	NA	NA
	CM3: Grassland		UNK	UNK				
	Total Protection		**200**	**200**	**NA**	**NA**	**NA**	**NA**

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late long-term timeframes.

[b] See discussion below for a description of applicable CMs.

[c] LLT acreages are a summation of effects that would occur in the near-term, early long-term and late long-term timeframes. The LLT acreages represent the total amount of habitat that would be affected over the 50-year life of the BDCP and do not reflect habitat increases that would result from restoration, creation and protection activities.

[d] Periodic effects were estimated for the late long-term only. Yolo periodic impacts are presented as a range based on different flow regimes at the proposed notch in Fremont Weir.

[e] Restored/created and protected habitat acreages represent planned conservation activities that would be implemented over the lifetime of the BDCP (see BDCP Chapter 3, *Conservation Strategy*, for specifics).

NT = near-term

LLT = late long-term

NA = not applicable

UNK= In addition to restoration and protection of riparian habitat for the riparian brush rabbit, the BDCP would protect, and, if necessary, create or restore an unknown number of acres of grasslands adjacent to suitable riparian vegetation in areas outside the floodplain levees.

Impact BIO-152: Loss or conversion of habitat for and direct mortality of riparian brush rabbit

Alternative 4 conservation measures would result in the permanent and temporary loss of up to 105 acres of riparian habitat and 244 acres of associated grassland habitat for the riparian brush rabbit in the study area (Table 12-4-54). Conservation measures resulting in permanent habitat loss include conveyance facilities construction (CM1), tidal natural communities restoration (CM4), and floodplain restoration (CM5). The effects of each activity are described below. A summary of the combined effects and NEPA and CEQA conclusions follows the discussion of individual conservation measures.

- *CM1 Water Facilities and Operation*: Development of Alternative 4 water conveyance facilities would result in the permanent removal of approximately 7 acres of riparian habitat and 150 acres of associated grassland habitat and in the temporary removal of 1 acre of riparian habitat and 30 acres of grassland habitat for riparian brush rabbit in CZ 8 (Table 12-4-54). The riparian habitat that would be removed is of low value for the riparian brush rabbit as it consists of several small, isolated patches surrounded by agricultural lands northeast of Clifton Court Forebay. The associated grasslands are also of low value for the species: They consist of long, linear strips that abut riparian habitat, but extend several miles from the riparian habitat and, therefore, provide few if any opportunities for adjacent cover. Trapping efforts conducted for the riparian brush rabbit in this area were negative (BDCP Appendix 3.F, *Conservation Principles for the Riparian Brush Rabbit and Riparian Woodrat*). Refer to the Terrestrial Biology Map Book for a detailed view of Alternative 4 construction locations.
- *CM4 Tidal Natural Communities Restoration*: Tidal habitat restoration site preparation and inundation would permanently remove approximately 19 acres of riparian habitat and 18 acres of associated grassland habitat for the riparian brush rabbit (Table 12-4-54) in CZ 7 in the late-longterm. The riparian habitat that would be removed consists of relatively small and isolated patches along canals and irrigation ditches surrounded by agricultural lands in the Union Island and Roberts Island areas, and several small patches along the San Joaquin River. The habitat that would be removed is not adjacent to any existing conserved lands, and is several miles north and northeast of the northernmost riparian brush rabbit record located northeast of Paradise Cut (Williams et al. 2002). Although the final footprint for tidal natural communities restoration would differ from the hypothetical footprint, compliance monitoring would be implemented to ensure that acreage limits are not exceeded and the measures described in AMM26 require that tidal natural communities restoration avoid removal of any habitat occupied by the riparian brush rabbit.
- *CM5 Seasonally Inundated Floodplain Restoration*: Levee construction associated with floodplain restoration would result in the permanent removal of approximately 43 acres of riparian habitat and 26 acres of associated grassland habitat for the riparian brush rabbit in CZ 7 in the late longterm (Table 12-4-54). The value of this habitat for riparian brush rabbit is high: although it consists of small patches and narrow bands of riparian vegetation, these areas are in proximity to, or contiguous with, habitat with recorded occurrences of riparian brush rabbit. The hypothetical footprint for levee construction overlaps with one occurrence record for riparian brush rabbit, south of the Interstate 5/Interstate 205 interchange.

  Although the final floodplain restoration design would differ from the hypothetical footprint used for this effects analysis, restoration of the river floodplain in CZ 7 would be targeted in the general area of the riparian brush rabbit population. Implementation of adaptive management described in AMM26 would ensure that riparian brush rabbit habitat permanently removed as a result of floodplain restoration does not exceed the amount estimated based on the hypothetical footprint

  Levee construction would also result in the temporary removal of 35 acre riparian habitat and 20 acres of grassland habitat for the riparian brush rabbit. Although the effects are considered temporary, five years to several decades may be required for ecological succession to occur and for restored riparian habitat to replace the function of habitat that has been affected.

- *CM11 Natural Communities Enhancement and Management*: A variety of habitat management actions included in CM11 that are designed to enhance wildlife values in BDCP protected habitats may result in localized ground disturbances that could temporarily remove small amounts of riparian brush rabbit habitat. Enhancement and management actions in riparian brush rabbit habitat within the reserve system may include invasive plant removal, planting and maintaining vegetation to improve and sustain habitat characteristics for the species, and creating and maintaining flood refugia. These activities are expected to have minor adverse effects on available riparian brush rabbit habitat and are expected to result in overall improvements to and maintenance of riparian brush rabbit habitat values over the term of the BDCP. These effects cannot be quantified, but are expected to be minimal and would be avoided and minimized through the AMMs listed below.
- Operations and maintenance: Ongoing maintenance of BDCP facilities are not expected to adversely affect the riparian brush rabbit because the species is not expected to occur in the vicinity of proposed facilities.
- Injury and direct mortality: Water conveyance facility construction is not is not likely to result in injury or mortality of individual riparian brush rabbits because the species is not likely to be present in the areas that would be affected by this activity, based on live trapping results (BDCP Appendix 3.F, *Conservation Principles for the Riparian Brush Rabbit and Riparian Woodrat*). Tidal natural communities restoration would not result in injury or mortality of the riparian brush rabbit because tidal natural communities restoration projects would be designed to avoid occupied riparian brush rabbit habitat and, if that is not possible, rabbits would be trapped and relocated as described in AMM26 (see BDCP Appendix 3.C). Activities associated with construction of setback levees for floodplain restoration could result in injury or mortality of riparian brush rabbits: however, preconstruction surveys, construction monitoring, and other measures would be implemented to avoid and minimize injury or mortality of this species during construction (AMM26).

The following paragraphs summarize the combined effects discussed above, describe other BDCP conservation actions that would offset or avoid these effects, and provide NEPA and CEQA impact conclusions.

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the effects of construction would not be adverse under NEPA.

Alternative 4 would remove 8 acres of riparian habitat and 180 acres of grassland habitat for riparian brush rabbit in the near-term as a result of construction of the water conveyance facilities (CM1). The habitat would be lost in the valley/foothill riparian and grassland natural communities. All the near-term loss of riparian brush rabbit habitat would be in an area unlikely to be occupied by the species. Habitat loss in CZ 7, in areas known or likely to be occupied, would occur during the early long-term and late long-term timeframes. Riparian restoration would be phased to minimize temporal habitat loss. There would be no near-term losses resulting from CM2–CM18.

Typical NEPA project-level mitigation ratios would be 1:1 for restoration and protection of the valley/foothill riparian natural community, and 2:1 for protection of grassland. These ratios indicate that 8 acres of riparian habitat should be restored, 8 acres of riparian habitat should protected, and 360 acres of grassland should be protected in the near-term to mitigate for CM1 habitat losses.

The BDCP has committed to near-term restoration of 300 acres of riparian and an unknown number of associated acres of grassland and protection of 200 acres of riparian with an unknown number of associated acres of grassland. The species-specific biological goals and objectives would inform the near-term protection and restoration efforts. The natural community restoration and protection activities are expected to be concluded during the first 10 years of plan implementation, which is close enough in time to the occurrence of impacts to constitute adequate mitigation for NEPA purposes. These commitments are more than sufficient to support the conclusion that the near-term effects of Alternative 4 would be not be adverse under NEPA, because the number of acres required to meet the typical ratios described above would be only 8 acres of riparian habitat restored, 8 acres protected, and 360 acres of grassland protected.

The plan also contains commitments to implement *AMM1 Worker Awareness Training*, *AMM2 Construction Best Management Practices and Monitoring, AMM3 Stormwater Pollution Prevention Plan*, *AMM4 Erosion and Sediment Control Plan*, *AMM5 Spill Prevention, Containment, and Countermeasure Plan, AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan*, *AMM7 Barge Operations Plan*, *AMM10 Restoration of Temporarily Affected Natural Communities*, and *AMM26 Riparian Woodrat and Riparian Brush Rabbit*. These AMMs contain elements that avoid or minimize the risk of BDCP activities affecting habitats and species adjacent to work areas and disposal sites. BDCP Appendix 3.C describes the AMMs in details.

Late Long-Term Timeframe

There are 5,997 acres of modeled riparian brush rabbit habitat in the Plan Area, consisting of 2,894 acres of riparian habitat and 3,103 acres of associated grassland habitat.

Alternative 4 a whole would result in permanent and temporary effects combined on 105 acres of modeled riparian habitat and 244 acres of modeled grassland habitat for riparian brush rabbit, representing 4% and 8% of the riparian and grassland modeled habitat.

The BDCP would restore at least 5,000 acres and protect at least 750 acres of valley/foothill riparian natural community, a portion of which is expected to consist of suitable riparian brush rabbit habitat. Assuming the restored and protected riparian natural community would provide suitable riparian brush rabbit habitat proportional to the amount that exists within this natural community in the Plan Area (16% of the valley foothill riparian natural community in the Plan Area is modeled riparian brush rabbit habitat), an estimated 798 acres of suitable riparian habitat would be restored (5,000 acres X 16%) and 200 acres of suitable habitat would be protected (750 acres X 16%). However, the amount of suitable habitat is likely to be higher than this estimated amount, since the proportions were applied to the entire Plan Area and most of the modeled habitat (74%) occurs in CZ 7, where riparian conservation would be concentrated. To ensure that a sufficient amount of the restored and protected valley/foothill riparian natural community specifically benefits the riparian brush rabbit, the BDCP would protect at least 200 acres of occupied riparian brush rabbit habitat (as a component of the 750-acre protection commitment) and restore or create at least 300 acres of riparian habitat (as a component of the 5,000-acre riparian restoration/creation commitment) that meets the ecological requirements of the riparian brush rabbit. The restored habitat would be within or adjacent to existing occupied habitat, or in areas that facilitate connectivity between occupied and other suitable habitat, to facilitate species dispersal and genetic interchange between populations.

In addition to restoration and protection of riparian habitat for the riparian brush rabbit, the BDCP would protect, and, if necessary, create or restore grasslands adjacent to suitable riparian vegetation in areas outside the floodplain levees. These grasslands are expected to provide additional foraging opportunities for the riparian brush rabbit and upland refugia during flood events. The floodplains would transition from areas that flood frequently (e.g., every 1 to 2 years) to areas that flood infrequently (e.g., every 10 years or more): these infrequently flooded areas would provide refuge for riparian brush rabbit during most years. The BDCP would also create and maintain mounds, levee sections or other high areas in restored and protected riparian areas that are designed specifically to provide flood refugia for riparian brush rabbit (Appendix 3.F, *Conservation Principles for the Riparian Brush Rabbit and Riparian Woodrat*).

Only a small proportion of the habitat losses would be considered occupied and of high value. The Alternative 4 conservation measures provide for large acreages of riparian brush rabbit riparian and grassland habitat to be protected and restored, and the BDCP includes a number of AMMs (AMM1–AMM7, AMM10 and AMM26) directed at minimizing or avoiding potential effects during construction and operation of the CMs. Overall, the BDCP would provide a substantial net benefit to the riparian brush rabbit through the increase in available habitat and habitat in protected status. These protected areas would be managed and monitored to support the species.

Considering the habitat restoration and protection associated with CM3, CM7, CM8 and CM11, guided by species-specific goals and objects and AMM1–AMM7, AMM10 and AMM26, the temporary and permanent losses of riparian and grassland habitat and potential for direct mortality of riparian brush rabbit as a result of implementing Alternative 4 would not represent a substantial adverse effect through habitat modifications and would not substantially reduce the number or restrict the range of the species. The loss of habitat and potential mortality of riparian brush rabbits would not be an adverse effect under NEPA.

CEQA Conclusion:

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the impacts of construction would be less than significant under CEQA.

Alternative 4 would remove 8 acres of riparian habitat and 180 acres of grassland habitat for riparian brush rabbit in the near-term as a result of construction of the water conveyance facilities (CM1). The habitat would be lost in the valley/foothill riparian and grassland natural communities. All the near-term loss of riparian brush rabbit habitat would occur in an area not likely to be occupied by the species. Habitat loss in CZ 7, in areas known or likely to be occupied, would occur during the early long-term and late long-term implementation periods. Riparian restoration would be phased to minimize temporal habitat loss. There would be no near-term losses from CM2–CM18.

Typical CEQA project-level mitigation ratios would be 1:1 for restoration and 1:1 for protection of the valley/foothill riparian natural community, and 2:1 for protection of grassland. These ratios indicate that 8 acres of riparian habitat should be restored, 8 acres should be protected, and 360 acres of grassland should be protected in the near-term to mitigate for CM1 habitat losses.

The BDCP has committed to near-term restoration of 300 acres of riparian and an unknown number of associated acres of grassland and protection of 200 acres of riparian with an unknown number of associated acres of grassland. The species-specific biological goals and objectives would inform the near-term protection and restoration efforts. The natural community restoration and protection activities are expected to be concluded during the first 10 years of plan implementation, which is close enough in time to the occurrence of impacts to constitute adequate mitigation for CEQA purposes. These commitments are more than sufficient to support the conclusion that the near-term impacts of Alternative 4 would be less than significant under CEQA, because the number of acres required to meet the typical ratios described above would be only 8 acres or riparian habitat protected, 8 acres of riparian habitat restored, and 360 acres of grassland habitat.

The plan also contains commitments to implement AMM1–AMM7, AMM10 and, AMM26. These AMMs contain elements that avoid or minimize the risk of BDCP activities affecting habitats and species adjacent to work areas and disposal sites. BDCP Appendix 3.C describes the AMMs in details.

Late Long-Term Timeframe

There are 5,997 acres of modeled riparian brush rabbit habitat in the Plan Area, consisting of 2,894 acres of riparian habitat and 3,103 acres of associated grassland habitat. Alternative 4 a whole would result in permanent and temporary effects combined on 105 acres of modeled riparian habitat and 244 acres of modeled grassland habitat for riparian brush rabbit, representing 4% and 8% of the riparian and grassland modeled habitat. Habitat lost in CZs 6 and 8 is fragmented, isolated, and unlikely to support the species. Habitat would also be lost in areas in CZ 7 that provide high-value habitat for the species.

The BDCP would restore at least 5,000 acres and protect at least 750 acres of valley/foothill riparian natural community, a portion of which is expected to consist of suitable riparian brush rabbit habitat. Assuming the restored and protected riparian natural community would provide suitable riparian brush rabbit habitat proportional to the amount that exists within this natural community in the Plan Area (16% of the valley foothill riparian natural community in the Plan Area is modeled riparian brush rabbit habitat), an estimated 798 acres of suitable riparian habitat would be restored (5,000 acres X 16%) and 200 acres of suitable habitat would be protected (750 acres X 16%). However, the amount of suitable habitat is likely to be higher than this estimated amount, since the proportions were applied to the entire Plan Area and most of the modeled habitat (74%) occurs in CZ 7, where riparian conservation would be concentrated. To ensure that a sufficient amount of the restored and protected valley/foothill riparian natural community specifically benefits the riparian brush rabbit, the BDCP would protect at least 200 acres of occupied riparian brush rabbit habitat (as a component of the 750-acre protection commitment) and restore or create at least 300 acres of riparian habitat (as a component of the 5,000-acre riparian restoration/creation commitment) that meets the ecological requirements of the riparian brush rabbit. The restored habitat would be within or adjacent to existing occupied habitat, or in areas that facilitate connectivity between occupied and other suitable habitat, to facilitate species dispersal and genetic interchange between populations.

In addition to restoration and protection of riparian habitat for the riparian brush rabbit, the BDCP would protect, and, if necessary, create or restore grasslands adjacent to suitable riparian vegetation in areas outside the floodplain levees. These grasslands are expected to provide additional foraging opportunities for the riparian brush rabbit and upland refugia during flood events. The floodplains would transition from areas that flood frequently (e.g., every 1 to 2 years) to areas that flood infrequently (e.g., every 10 years or more): these infrequently flooded areas would provide refuge for riparian brush rabbit during most years. The BDCP would also create and maintain mounds, levee sections or other high areas in restored and protected riparian areas that are designed specifically to provide flood refugia for riparian brush rabbit (Appendix 3.F, *Conservation Principles for the Riparian Brush Rabbit and Riparian Woodrat*).

Only a small proportion of the habitat losses would be considered occupied and of high-value. Alternative 4 conservation measures provide for large acreages of riparian brush rabbit riparian and grassland habitat to be protected and restored, and the BDCP includes AMMs (AMM1–AMM7, AMM10, and AMM26) directed at minimizing or avoiding potential effects during construction and operation of the CMs. Overall, the BDCP would provide a substantial net benefit to the riparian brush rabbit through the increase in available habitat and habitat in protected status.

These protected areas would be managed to support the species. Considering the habitat restoration and protection associated with CM3, CM7, CM8 and CM11, guided by species-specific goals and objects and AMM1–AMM7, AMM10, and AMM26, the temporary and permanent losses of riparian and grassland habitat and potential for direct mortality of riparian brush rabbit as a result of implementing Alternative 4 would not represent a substantial adverse effect through habitat modifications and would not substantially reduce the number or restrict the range of the species. The loss of habitat and potential mortality of riparian brush rabbits would be a less-than-significant impact under CEQA.

Impact BIO-153: Indirect effects of plan implementation on riparian brush rabbit

Noise and visual disturbance adjacent to construction activities could indirectly affect the use of modeled riparian brush rabbit riparian habitat and of associated grassland habitat. These construction activities would include water conveyance (including transmission line) construction in CZ 8, tidal natural communities restoration construction, and construction of setback levees. Water conveyance construction would potentially affect acres of adjacent riparian habitat and of associated grassland habitat: this construction would occur in CZ 8, and the riparian brush rabbit is not known from this zone; therefore, the potential for adverse noise and visual effects from conveyance facility construction would be minimal. Tidal natural communities restoration construction would also potentially affect adjacent riparian habitat and associated grassland habitat for this species: however, adverse effects on the species are unlikely because tidal natural communities restoration projects would be sited to avoid areas occupied by riparian brush rabbit. The activity most likely to result in noise and visual disturbance to riparian brush rabbit is the construction of setback levees, which would take place in CZ 7, where the species is known to occur. The use of mechanical equipment during construction might cause the accidental release of petroleum or other contaminants that would affect the riparian brush rabbit in adjacent habitat, if the species is present.

Implementation of the AMMs listed above as part of implementing BDCP Alternative 4 would avoid the potential for substantial adverse effects on riparian brush rabbits, either indirectly or through habitat modifications or result in a substantial reduction in numbers or a restriction in the range of riparian brush rabbits. Therefore, indirect effects of Alternative 4 would not have an adverse effect on riparian brush rabbit.

CEQA Conclusion: Indirect effects from conservation measure operations and maintenance as well as construction-related noise and visual disturbances could affect riparian brush rabbit in riparian and grassland habitats. The use of mechanical equipment during construction could cause the accidental release of petroleum or other contaminants that could affect riparian brush rabbit. The inadvertent discharge of sediment or excessive dust adjacent to riparian brush rabbit habitat could also have a negative effect on the species. With implementation of AMM1–AMM7, AMM10, and AMM26 as part of Alternative 4, the BDCP would avoid the potential for substantial adverse effects on riparian brush rabbits, either indirectly or through habitat modifications and would not result in a substantial reduction in numbers or a restriction in the range of riparian brush rabbits. Indirect effects of Alternative 4 would have a less-than-significant impact on riparian brush rabbit.

Impact BIO-154: Periodic effects of inundation of riparian brush rabbit habitat as a result of implementation of conservation components

Floodplain restoration is the only covered activity expected to result in periodic inundation of riparian brush rabbit habitat. This activity would periodically inundate approximately 264 acres of riparian habitat (9% of riparian habitat in the Plan Area) and 423 acres of associated grassland habitat (14% of associated grassland habitat in the Plan Area) for the riparian brush rabbit. The area between existing levees that would be breached and the newly constructed setback levees would be inundated through seasonal flooding. The potentially inundated areas consist of high-value habitat for the species: although they consist of small patches and narrow bands of riparian vegetation, many of these areas are in proximity to, or contiguous with, habitat with recorded occurrences of riparian brush rabbit. The restored floodplain would include a range of elevations from lower lying areas that flood frequently (e.g., every 1 to 2 years) to higher elevation areas that flood infrequently (e.g., every 10 years or more).

Seasonal flooding in restored floodplains can result in injury or mortality of individuals if riparian brush rabbits occupy these areas and cannot escape flood waters. One recorded occurrence of riparian brush rabbit (Williams et al. 2002), just west of Stewart Road in Mossdale, is in the area that would be seasonally flooded based on the hypothetical restoration footprint.

Floodplain restoration under CM5 would periodically affect a total of 264 acres of riparian habitat and 423 acres of grassland habitat for riparian brush rabbit. These acreages are a small proportion of the modeled riparian brush rabbit habitat in the study area. The adverse effects of periodic inundation on the riparian brush rabbit would be minimized through construction and maintenance of flood refugia to allow riparian brush rabbits to escape inundation. Therefore, implementing Alternative 4, including AMM1–AMM7, AMM10, and AMM26, would not be expected to result in substantial adverse effects on riparian brush rabbit, either indirectly or through habitat modifications and would not result in a substantial reduction in numbers or a restriction in the range of riparian brush rabbits. Therefore, Alternative 4 would not adversely affect the species.

CEQA Conclusion: Floodplain restoration under CM5 would periodically affect a total of 264 acres of riparian habitat and 423 acres of grassland habitat for riparian brush rabbit. These acreages are a small proportion of the modeled riparian brush rabbit habitat in the study area. The overall effect of seasonal inundation on existing riparian natural communities may instead be beneficial. Historically, flooding was the main natural disturbance regulating ecological processes in riparian areas, and flooding promotes the germination and establishment of many native riparian plants. In the late long-term, seasonal inundation in areas currently occupied by riparian vegetation may contribute to the establishment of high-value habitat for covered riparian species, such as the riparian brush rabbit. Long-term management of riparian areas would ensure that refugia also exist along the edges of seasonally inundated habitat.

The adverse effects of periodic inundation on the riparian brush rabbit would be minimized through construction and maintenance of flood refugia to allow riparian brush rabbits to escape inundation. Therefore, implementing Alternative 4, including AMM1–AMM7, AMM10, and AMM26, would not be expected to result in substantial adverse effects on riparian brush rabbit, either indirectly or through habitat modifications and would not result in a substantial reduction in numbers or a restriction in the range of riparian brush rabbits. Periodic inundation of riparian and grassland habitat for riparian brush rabbit under Alternative 4 would have a less-than-significant impact on the species.

Riparian Woodrat

The habitat model used to assess effects for the riparian woodrat consists of selected plant alliances from the valley/foothill riparian natural community, geographically constrained to the south Delta portion of the BDCP area in CZ 7, south of State Route 4 and Old River Pipeline along the Stanislaus, San Joaquin, Old, and Middle Rivers. Valley/foothill riparian areas along smaller drainages (Paradise Cut, Tom Paine Slough), and some larger streams in the northern portion of CZ 7 were excluded from the riparian woodrat habitat model due to a lack of trees or riparian corridors that were too narrow. Factors considered in assessing the value of affected habitat for the riparian woodrat, to the extent that information is available, include habitat patch size and connectivity.

The riparian woodrat is not known to occur in the study area. The only verified extant population of riparian woodrats rangewide is 2 miles east of the southern end of the study area in Caswell Memorial State Park along the Stanislaus River (Williams 1986:1–112; Williams 1993). Riparian woodrat may occur in small patches of valley oak riparian forest along the San Joaquin River from the southern tip of the study area north to approximately the Interstate 5 overcrossing near Lathrop (Figure 12-47). Because the species is not known to occur in the study area it is not expected to be affected by BDCP actions unless the species were to establish in the study area over the term of the BDCP. Tidal habitat restoration, floodplain restoration, and protection and management of natural communities could affect modeled riparian woodrat habitat. The BDCP conservation approach for the riparian woodrat is to provide opportunities for population expansion into the study area from adjacent lands to the south and southeast. The strategy focuses on restoring and maintaining suitable habitat at the southernmost end of CZ 7, providing connectivity with existing populations to the south and southeast, and creating and maintaining flood refugia.

Construction and restoration associated with Alternative 4 conservation measures would result in both temporary and permanent losses of riparian woodrat modeled habitat as indicated in Table 12-4-55. The BDCP would restore at least 5,000 acres and protect at least 750 acres of valley/foothill riparian natural community, a portion of which is expected to occur in CZ 7 and consist of suitable riparian woodrat habitat. Assuming the restored and protected riparian natural community would provide suitable riparian woodrat habitat proportional to the amount that currently exists within this natural community in the Plan Area (12% of the valley foothill riparian natural community in the Plan Area consists of modeled riparian woodrat habitat), an estimated 595 acres would be restored (5,000 acres valley foothill riparian restored X 12%) and an estimated 89 acres protected (750 acres valley foothill riparian protected X 12%) that provide suitable riparian habitat for this species. However, the amount of suitable habitat is likely to be higher than this estimated amount, since the proportions were applied to the entire Plan Area and most of the modeled habitat (96%) is limited to CZ7, where riparian conservation would be concentrated. To ensure that a sufficient amount of the restored and protected valley/foothill riparian natural community specifically benefits the riparian woodrat, the BDCP would restore and maintain at least 300 acres of riparian habitat that meets the ecological requirements of the riparian woodrat (e.g., dense willow understory and oak overstory) and that is adjacent to or facilitates connectivity with existing occupied or potentially occupied habitat. Therefore, Alternative 4 impacts on riparian woodrat would not be adverse for NEPA purposes and would be less than significant under CEQA.

Table 12-4-55. Changes in Riparian Woodrat Modeled Habitat Associated with Alternative 4 (acres)[a]

	Conservation Measure[b]	Habitat Type	Permanent		Temporary		Periodic[d]	
			NT	LLT	NT	LLT	Yolo	Floodplain
Habitat Affected[c]	CM1	Riparian	0	0	0	0	NA	NA
	Total Impacts CM1		**0**	**0**	**0**	**0**	**NA**	**NA**
	CM2–CM18	Riparian	0	51	0	33	0	202
	Total Impacts CM2–CM18		**0**	**51**	**0**	**33**	**0**	**202**
	TOTAL IMPACTS		**0**	**51**	**0**	**33**	**0**	**202**
Habitat Restored/ Created[e]	CM7: Riparian		300	595	NA	NA	NA	NA
	Total Restoration/Creation		**300**	**595**				
Habitat Protected[e]	CM3: Riparian		89	89	NA	NA	NA	NA
	Total Protection		**89**	**89**				

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late long-term timeframes.

[b] See discussion below for a description of applicable CMs.

[c] LLT acreages are a summation of effects that would occur in the near-term, early long-term and late long-term timeframes. The LLT acreages represent the total amount of habitat that would be affected over the 50-year life of the BDCP and do not reflect habitat increases that would result from restoration, creation and protection activities.

[d] Periodic effects were estimated for the late long-term only. Yolo periodic impacts are presented as a range based on different flow regimes at the proposed notch in Fremont Weir.

[e] Restored/created and protected habitat acreages represent planned conservation activities that would be implemented over the lifetime of the BDCP (see BDCP Chapter 3, *Conservation Strategy*, for specifics).

NT = near-term

LLT = late long-term

NA = not applicable

Impact BIO-155: Loss or conversion of habitat for and direct mortality of riparian woodrat

Alternative 4 conservation measures would result in the permanent loss of up to 51 acres of habitat (2% of the habitat in the study area) and temporary loss of up to 33 acres of habitat for riparian woodrat (Table 12-4-55). Construction of Alternative 4 water conveyance facilities (CM1) would not affect modeled riparian woodrat habitat; however, tidal natural communities restoration (CM4) and seasonally inundated floodplain restoration (CM5) would remove habitat. Seasonally inundated floodplain restoration (CM5) is expected to result in the majority (41 acres, or 81%) of the permanent habitat loss. (CM11) could result in local adverse effects and potentially injure or kill riparian woodrats. A summary of the combined effects and NEPA and CEQA conclusions follow the individual conservation measure discussions.

- *CM4 Tidal Natural Communities Restoration*: Tidal habitat restoration site preparation and inundation would permanently remove approximately 10 acres of riparian habitat for the riparian woodrat (Table 12-4-55) in CZ 7. This habitat is of low value, consisting of a small, isolated patch surrounded by agricultural lands, and the species has a relatively low likelihood of being present in these areas. The measures described in *AMM26 Riparian Woodrat and Riparian Brush Rabbit*, require that tidal natural communities restoration avoid removal of any habitat occupied by the riparian woodrat. Because the estimates of habitat loss due to tidal inundation are based on projections of where restoration may occur, actual habitat loss is expected to be lower because sites would be selected to minimize effects on riparian woodrat.

- *CM5 Seasonally Inundated Floodplain Restoration*: Levee construction associated with floodplain restoration would result in the permanent removal of approximately 41 acres of riparian habitat for the riparian woodrat in CZ 7 (Table 12-4-55). The value of this habitat for riparian woodrat is moderate. Although the habitat consists of small patches and narrow bands of riparian vegetation and no riparian woodrats have been detected in CZ7, the riparian patches are in proximity to each other along the San Joaquin River. There are two species occurrences immediately south of CZ 7, one of which is less than 1.5 mile from the southernmost patch of riparian habitat potentially affected by levee construction.

  The final floodplain restoration design would differ from the hypothetical footprint used for this effects analysis. However, monitoring and adaptive management described in *CM11 Natural Communities Enhancement and Management.* And AMM26 would ensure that riparian brush rabbit habitat permanently removed as a result of floodplain restoration does not exceed the amount estimated based on the hypothetical footprint. Habitat loss is expected to be lower than 41 acres because sites would be selected and restoration designed to minimize effects on the riparian woodrat. If natural flooding is insufficient to maintain appropriate riparian woodrat vegetation structure, the vegetation would be actively managed to provide suitable habitat structure as described in *CM11 Natural Communities Enhancement and Management.*

  Levee construction would also result in the temporary removal of 33 acres of riparian habitat for the riparian woodrat. Although the effects are considered temporary, 5 years to several decades may be required for ecological succession to occur and for restored riparian habitat to replace the function of habitat that has been affected.

- *CM11 Natural Communities Enhancement and Management*: As described in the BDCP, restoration of up to 5,000 acres and protection of up to 750 acres of riparian habitat would benefit the riparian woodrat (Table 12-4-55). A variety of habitat management actions included in CM11 that are designed to enhance wildlife values in BDCP protected habitats may result in localized ground disturbances that could temporarily remove small amounts of riparian woodrat habitat. Enhancement and management actions in riparian woodrat habitat within the reserve system may include invasive plant removal, planting and maintaining vegetation to improve and sustain habitat characteristics for the species, and creating and maintaining flood refugia. These activities are expected to have minor adverse effects on available riparian woodrat habitat and are expected to result in overall improvements to and maintenance of riparian woodrat habitat values over the term of the BDCP. These effects cannot be quantified, but are expected to be minimal and would be avoided and minimized through the AMMs listed below.

- Operations and maintenance: The only ongoing effects on the riparian woodrat are those potentially resulting from habitat enhancement and management activities. Enhancement and management actions in riparian brush rabbit habitat within the reserve system may include invasive plant removal, planting and maintaining vegetation to improve and sustain habitat characteristics for the species, and creating and maintaining flood refugia. These activities may result in harassment of riparian brush rabbits through noise and visual disturbance which would be minimized with implementation of AMM1–AMM7, AMM10, and AMM26.

- Injury and direct mortality: Water conveyance facility construction is not likely to result in injury or mortality of individual riparian woodrats because the species is not likely to be present in the areas that would be affected by this activity, based on live trapping results (BDCP Appendix 3.F, *Conservation Principles for the Riparian Brush Rabbit and Riparian Woodrat*). Tidal natural communities restoration would not result in injury or mortality of the riparian woodrats because tidal natural communities restoration projects would be designed to avoid occupied riparian woodrat habitat and if that is not possible to trap and relocate the species (AMM26). Activities associated with construction of setback levees for floodplain restoration could result in injury or mortality of riparian woodrats: however, preconstruction surveys, construction monitoring, and other measures would be implemented to avoid and minimize injury or mortality of this species during construction, as described in the AMMs listed below.

The following paragraphs summarize the combined effects, describe other BDCP conservation actions that offset or avoid these effects, and provide NEPA and CEQA conclusions.

Near-Term Timeframe

Because water conveyance facilities construction is being evaluated at the project level, the near-term BDCP strategy has been analyzed to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the construction effects would not be adverse under NEPA.

No riparian woodrat habitat would be lost in the near-term timeframe. Implementation of CM11 could have minor adverse effects on available riparian woodrat habitat, and activities associated with construction of setback levees for floodplain restoration could result in injury or mortality of riparian woodrats. These effects cannot be quantified, but are expected to be minimal and would be avoided and minimized through the BDCP's commitment to *AMM1 Worker Awareness Training*, *AMM2 Construction Best Management Practices and Monitoring*, *AMM3 Stormwater Pollution Prevention Plan*, *AMM4 Erosion and Sediment Control Plan*, *AMM5 Spill Prevention, Containment, and Countermeasure Plan*, *AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan*, *AMM7 Barge Operations Plan*, *AMM10 Restoration of Temporarily Affected Natural Communities*, and *AMM26 Riparian Woodrat and Riparian Brush Rabbit.* BDCP Appendix 3.C describes the AMMs in detail.

Late Long-Term Timeframe

The study area supports approximately 2,156 acres of modeled riparian woodrat habitat. Alternative 4 as a whole would result in the permanent loss of and temporary removal of 84 acres of modeled habitat for riparian woodrat habitat during the late-longterm. None of this habitat is considered occupied.

The BDCP would restore at least 5,000 acres and protect at least 750 acres of valley/foothill riparian natural community, a portion of which is expected to occur in CZ 7 and consist of suitable riparian woodrat habitat. Assuming the restored and protected riparian natural community would provide suitable riparian woodrat habitat proportional to the amount that currently exists within this natural community in the Plan Area (12% of the valley foothill riparian natural community in the Plan Area consists of modeled riparian woodrat habitat), an estimated 595 acres would be restored

(5,000 acres valley foothill riparian restored X 12%) and an estimated 89 acres protected (750 acres valley foothill riparian protected X 12%) that provide suitable riparian habitat for this species. However, the amount of suitable habitat is likely to be higher than this estimated amount, since the proportions were applied to the entire Plan Area and most of the modeled habitat (96%) is limited to CZ7, where riparian conservation would be concentrated. To ensure that a sufficient amount of the restored and protected valley/foothill riparian natural community specifically benefits the riparian woodrat, the BDCP would restore and maintain at least 300 acres of riparian habitat that meets the ecological requirements of the riparian woodrat (e.g., dense willow understory and oak overstory) and that is adjacent to or facilitates connectivity with existing occupied or potentially occupied habitat.

Although there are no records of occurrences of the riparian woodrat in the study area, habitat restoration in CZ 7, in the vicinity of occurrences south of the study area, would increase opportunities for northward expansion of the species into the study area Implementation of Alternative 4 conservation measures is not expected to adversely affect the riparian woodrat for the following reasons.

- There are no riparian woodrat occurrences in the Plan Area.
- The habitat that would be removed consists of small patches that are of moderate value for the species.
- The habitat that would be removed permanently is a small proportion of the total habitat in the Plan Area (2%).
- Avoidance and minimization measures would be implemented to avoid injury or mortality of riparian woodrats, and to minimize loss of occupied habitat.
- Floodplain restoration would be designed to provide flood refugia so that flooding would not adversely affect any riparian woodrats that occupy restored floodplains.

Alternative 4 would provide a substantial benefit to the riparian woodrat through the net increase in available habitat and a net increase of habitat in protected status. These protected areas would be managed and monitored to support the species. The affected habitat is currently unoccupied and habitat removal is not expected to result in a discernible change in the abundance or distribution of riparian woodrat should they occupy study area habitats. Should the species be detected in the study area, AMM1–AMM7, AMM10, and AMM26 would avoid and minimize the effects of conservation component construction and implementation. Therefore, the loss of habitat and potential mortality of individuals would not have an adverse effect on riparian woodrat.

CEQA Conclusion:

Near-Term Timeframe

Because water conveyance facilities construction is being evaluated at the project level, the near-term BDCP strategy has been analyzed to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the construction effects would be less than significant for CEQA purposes.

No riparian woodrat habitat would be lost in the near-term timeframe. Implementation of CM11 could have minor adverse effects on available riparian woodrat habitat, and activities associated with construction of setback levees for floodplain restoration could result in injury or mortality of riparian woodrats. These effects cannot be quantified, but are expected to be minimal and would be avoided and minimized through the BDCP's commitment to AMM1–AMM7, AMM10, and AMM26. BDCP Appendix 3.C describes the AMMs in detail.

Late Long-Term Timeframe

Based on modeled habitat, the study area supports approximately 2,156 acres of modeled riparian woodrat habitat. Alternative 4 as a whole would result in the permanent loss of and temporary removal of 84 acres of modeled habitat for riparian woodrat habitat during the late-longterm. None of this habitat is considered occupied.

The BDCP would restore at least 5,000 acres and protect at least 750 acres of valley/foothill riparian natural community, a portion of which is expected to occur in CZ 7 and consist of suitable riparian woodrat habitat. Assuming the restored and protected riparian natural community would provide suitable riparian woodrat habitat proportional to the amount that currently exists within this natural community in the Plan Area (12% of the valley foothill riparian natural community in the Plan Area consists of modeled riparian woodrat habitat), an estimated 595 acres would be restored (5,000 acres valley foothill riparian restored X 12%) and an estimated 89 acres protected (750 acres valley foothill riparian protected X 12%) that provide suitable riparian habitat for this species. However, the amount of suitable habitat is likely to be higher than this estimated amount, since the proportions were applied to the entire Plan Area and most of the modeled habitat (96%) is limited to CZ7, where riparian conservation would be concentrated. To ensure that a sufficient amount of the restored and protected valley/foothill riparian natural community specifically benefits the riparian woodrat, the BDCP would restore and maintain at least 300 acres of riparian habitat that meets the ecological requirements of the riparian woodrat (e.g., dense willow understory and oak overstory) and that is adjacent to or facilitates connectivity with existing occupied or potentially occupied habitat.

Although there are no records of occurrences of the riparian woodrat in the study area, habitat restoration in CZ 7, in the vicinity of occurrences south of the study area, would increase opportunities for northward expansion of the species into the study area Implementation of Alternative 4 conservation measures is not expected to adversely affect the riparian woodrat for the following reasons.

- There are no riparian woodrat occurrences in the Plan Area.
- The habitat that would be removed consists of small patches that are of moderate value for the species.
- The habitat that would be removed permanently is a small proportion of the total habitat in the Plan Area (2%).
- Avoidance and minimization measures would be implemented to avoid injury or mortality of riparian woodrats, and to minimize loss of occupied habitat.
- Floodplain restoration would be designed to provide flood refugia so that flooding would not adversely affect any riparian woodrats that occupy restored floodplains.

Alternative 4 would provide a substantial benefit to the riparian woodrat through the net increase in available habitat and a net increase of habitat in protected status. These protected areas would be managed and monitored to support the species. The affected habitat is currently unoccupied and habitat removal is not expected to result in a discernible change in the abundance or distribution of riparian woodrat should they occupy study area habitats. Should the species be detected in the study area, AMM1–AMM7, AMM10, and AMM26 would avoid and minimize the effects of conservation component construction and implementation. Therefore, the loss of habitat and potential mortality of individuals would not have a significant impact on riparian woodrat.

Impact BIO-156: Indirect effects of plan implementation on riparian woodrat

Noise and visual disturbance adjacent to construction activities could indirectly affect the use of modeled habitat for riparian woodrat. These effects are related construction activities associated with water conveyance construction, tidal natural communities restoration construction, and construction of setback levees. Indirect effects on the species from construction associated with tidal natural communities restoration are unlikely because tidal natural communities restoration projects would be sited to avoid areas occupied by riparian woodrat (AMM26) The activity most likely to result in noise and visual disturbance to riparian woodrat is the construction of setback levees. These adverse effects would be minimized through implementation of AMM1–AMM7, AMM10, and AMM26.

CEQA Conclusion: Should the species be detected in the study area, indirect effects of conservation measure construction and implementation could impact riparian woodrat and its habitat. AMM1–AMM7, AMM10, and AMM26 would avoid and minimize the impact.

Impact BIO-157: Periodic effects of inundation of riparian woodrat habitat as a result of implementation of conservation components

Seasonal flooding as a result of floodplain restoration is the only covered activity expected to result in periodic inundation of riparian woodrat habitat. Floodplain restoration would result in periodic inundation of up to 202 acres of riparian woodrat habitat (9% of the riparian woodrat habitat in the Plan Area). The area between existing levees that would be breached and the newly constructed setback levees would be inundated through seasonal flooding. The potentially inundated areas consist of moderate-value habitat for the species. Although the habitat consists of small patches and narrow bands of riparian vegetation and no riparian woodrats have detected in CZ 7, the riparian patches are in proximity to each other along the San Joaquin River and there are two species occurrences immediately south of CZ 7, one of which is less than 1 mile from the southernmost patch of riparian habitat potentially affected by levee construction. The restored floodplains would transition from areas that flood frequently (e.g., every 1 to 2 years) to areas that flood infrequently (e.g., every 10 years or more).

Alternative 4’s period inundation of 202 acres of riparian habitat for riparian woodrat is Alternative 4 not expected to result in substantial adverse effects on riparian woodrat, either directly or through habitat modifications and would not result in a substantial reduction in numbers or a restriction in the range of riparian woodrat. The effects of periodic inundation on the riparian woodrat would be minimized through construction and maintenance of flood refugia to allow riparian woodrats to escape inundation. Therefore, the periodic inundation of riparian woodrat habitat would not adversely affect the species Alternative 4.

CEQA Conclusion: Floodplain restoration under CM5 would periodically affect a total of 202 acres of riparian habitat for riparian woodrat, representing 9% of the 2,156 acres of modeled riparian woodrat habitat in the study area. The impact of periodic inundation on the riparian woodrat would be minimized through construction and maintenance of flood refugia to allow riparian woodrats to escape inundation, as described in AMM26. Implementation of CM5 would not be expected to result in significant impacts on riparian woodrat, either directly or through habitat modifications, and would not result in a substantial reduction in numbers or a restriction in the range of riparian woodrats. Periodic inundation of riparian woodrat habitat under Alternative 4 would have a less-than-significant impact.

Salt Marsh Harvest Mouse

The habitat model used to assess effects for the salt marsh harvest mouse includes six habitat types: primary tidal marsh habitat, secondary tidal marsh habitat (low marsh), secondary upland habitat adjacent to tidal marsh habitat, primary habitat within managed wetlands, secondary habitat within managed wetlands (dominated by plants characteristic of low marsh), and upland habitats within managed wetland boundaries. The tidal and managed wetland habitats were discriminated recognizing that regardless of habitat value, managed wetlands are at high risk of catastrophic flooding and have lower long-term conservation value than tidal wetlands.

Construction and restoration associated with Alternative 4 conservation measures would result in effects to modeled salt marsh harvest mouse habitat, which would include permanent losses and habitat conversions (i.e., existing habitat converted to greater or lesser valued habitat for the species post-restoration) as indicated in Table 12-4-56. All of the effects to the species would take place over an extended period of time as tidal marsh is restored in the Plan Area. Full implementation of Alternative 4 would restore or create 3,000 acres of tidal brackish emergent wetland (CM4), the protection of 6,500 acres of managed wetlands(1,500 acres of which would be specifically managed for salt marsh harvest mouse (CM3)), and the protection and/or restoration of grassland adjacent to tidal restoration (areas within 200 feet of tidal restoration) to provide upland refugia for salt marsh harvest mouse (CM3 and CM8). Alternative 4 with the use of the alternative transmission line alignment would have the same effects as the proposed transmission line alignment. As explained below, with the restoration or protection of these amounts of habitat, impacts on the salt marsh harvest mouse would not be adverse for NEPA purposes and would be less than significant for CEQA purposes.

Table 12-4-56 shows what appears to be a decrease in effects for the upland secondary habitat category from the near-term to the late long-term. The numbers in this table are based on the tidal restoration modeling and post-processing done for the BDCP, which accounts for projected sea level rise and other hydrologic changes resulting from the implementation of Alternative 4. Subsequently, some areas of tidal brackish emergent wetland restored in the near-term would become converted to different subcategories of tidal habitat by the late long-term due to these modeled changes over time.

Table 12-4-56. Changes in Salt Marsh Harvest Mouse Modeled Habitat Associated with Alternative 4 (acres)[a]

	Conservation Measure[b]	Habitat Type	Permanent		Temporary		Periodic[d]	
			NT	LLT	NT	LLT	Yolo	Floodplain
Habitat Affected[c]	CM1	(CM1 Outside of species range)	0	0	0	0	NA	NA
	Total Impacts CM1		**0**	**0**	**0**	**0**		
	CM2–CM18	*TBEW Primary*	64	67	0	0	0	0
		TBEW Secondary	0	0	0	0	0	0
		Upland Secondary	8	3	0	0	0	0

	MW Wetland Primary	1,913	5,323	0	0	0	0
	MW Wetland Secondary	315	807	0	0	0	0
	MW Upland	165	762	0	0	0	0
	Total Impacts CM2–CM18	**2,465**	**6,962**	**0**	**0**	**0**	**0**
	TOTAL IMPACTS	**2,645**	**6,962**	**0**	**0**	**0**	**0**
Habitat Restored/ Created[e]	CM4 Tidal Restoration–*Tidal Brackish Emergent Wetland*	1,000	3,000	NA	NA	NA	NA
	Total Restoration/Creation	**1,000**	**3,000**				
Habitat Protected[e]	CM3 Natural Communities Protection and Restoration–*Managed Wetland*	3,200	6,500	NA	NA	NA	NA
	CM3 Natural Communities Protection and Restoration–*Grasslands*	--	unknown	NA	NA	NA	NA
	Total Protection	**3,200**	**6,500**				

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late long-term timeframes.
[b] See discussion below for a description of applicable CMs.
[c] LLT acreages are a summation of effects that would occur in the near-term, early long-term and late long-term timeframes. The LLT acreages represent the total amount of habitat that would be affected over the 50-year life of the BDCP and do not reflect habitat increases that would result from restoration, creation and protection activities.
[d] Periodic effects were estimated for the late long-term only. Yolo periodic impacts are presented as a range based on different flow regimes at the proposed notch in Fremont Weir.
[e] Restored/created and protected habitat acreages represent planned conservation activities that would specifically benefit the species and be implemented over the lifetime of the BDCP (see BDCP Chapter 3, *Conservation Strategy*, for specifics).

TBEW = tidal brackish emergent wetland
NT = near-term
LLT = late long-term
NA = not applicable

Impact BIO-158: Loss or conversion of habitat and direct mortality of salt marsh harvest mouse

BDCP tidal restoration (CM4) would be the only conservation measure resulting in effects on salt marsh harvest mouse habitat. Habitat enhancement and management activities (CM11), which include ground disturbance or removal of nonnative vegetation, could result in local adverse habitat effects. Each of these activities is described in detail below. A summary statement of the combined impacts and NEPA and CEQA conclusions follows the individual conservation measure discussions.

- *CM4 Tidal Natural Communities Restoration* would result in effects to 6,962 acres of salt marsh harvest mouse modeled habitat, which would include 5,376 acres of permanent losses and 1,586 acres of habitat conversions. Salt marsh harvest mouse may be displaced temporarily from areas of converted habitat but these areas would ultimately provide suitable habitat for the species. However, 1,058 of these acres would be downgraded from primary habitat (67 acres of primary tidal brackish emergent wetland and 991 acres of primary managed wetland) to secondary tidal brackish emergent wetland.

- *CM11 Natural Communities Enhancement and Management:* As described in the BDCP, the restoration of at least 1,500 acres of tidal brackish emergent wetland would be managed to provide viable habitat for salt marsh harvest mouse and the protection of 1,500 acres of managed wetland specifically to be managed for salt marsh harvest mouse. A variety of habitat management actions included in *CM11 Natural Communities Enhancement and Management* that are designed to enhance and manage these areas for salt marsh harvest mouse and may result in localized ground disturbances that could temporarily remove small amounts of salt marsh harvest mouse habitat. The 1,500 acres other restored tidal brackish emergent wetlands, the protection of 5,000 acres of manage wetlands, and the protection and/or restoration of grasslands within 200 feet of restored salt marsh harvest mouse habitat would also have enhancement and management actions that would include invasive species control, non-native wildlife control, and vegetation management. Ground-disturbing activities, such as removal of nonnative vegetation are expected to have minor effects on habitat and are expected to result in overall improvements to and maintenance of salt marsh harvest mouse habitat values over the term of the BDCP. These effects cannot be quantified, but are expected to be minimal and would be avoided and minimized by the AMMs listed below.
- Injury and Direct Mortality: The use of heavy equipment and handtools may result in injury or mortality to salt marsh harvest mouse during restoration, enhancement, and management activities. However, preconstruction surveys, construction monitoring, and other measures would be implemented to avoid and minimize injury or mortality of this species during these activities, as required by the AMM described below.

The following paragraphs summarize the combined effects discussed above and describe other BDCP conservation actions that offset or avoid these effects. NEPA and CEQA impact conclusions are also included.

Near-Term Timeframe

The near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection and/or restoration in an appropriate timeframe to ensure that the effects of near-term covered activities would not be adverse under NEPA. The Plan would affect 2,465 acres of salt marsh harvest mouse modeled habitat in the study area in the near-term. These effects include 1,517 acres of permanent loss and 948 acres of converted habitat. Most of the habitat converted would be from primary habitats (599 acres consisting of 64 acres of tidal brackish emergent wetland and 534 acres of managed wetland) converted to secondary tidal brackish emergent wetland.

The BDCP has committed to near-term goals of restoring 1,000 acres of tidal brackish emergent wetland, the protection and/or restoration of grasslands within 200 feet of restored tidal wetlands, and the protection and enhancement of 3,200 acres of managed wetlands (1,500 acres of which would be specifically managed for salt marsh harvest mouse). Though there would be a net loss of modeled habitat, all of these losses are to managed wetlands, which according to the U.S. Fish and Wildlife Service are at high risk of catastrophic flooding (U.S. Fish and Wildlife Service 2010) and have lower long-term conservation value than tidal wetlands. The species-specific biological goals and objectives would inform the near-term protection and restoration efforts. These Plan goals represent performance standards for considering the effectiveness of restoration actions. The acres of protection and restoration contained in the near-term Plan goals would keep pace with the loss of habitat and effects to salt marsh harvest mouse habitat.

Other factors relevant to effects on salt marsh harvest mouse are listed below.

- Tidal restoration actions would not immediately displace salt marsh harvest mouse in managed wetlands as noted in the draft recovery plan for salt marsh harvest mouse because the conversion of managed wetland to tidal marsh would be gradual. Tidal marsh restoration is often accomplished by breaching levees and converting diked nontidal marsh currently occupied by salt marsh harvest mouse populations to tidal wetlands, their historic condition. Conversion of these subsided areas requires sedimentation and accretion over time to restore marsh plains, resulting in a prolonged period (sometimes a decade or more) in which resident mice populations are displaced by uninhabitable aquatic areas (U.S. Fish and Wildlife Service 2010). Despite these temporary adverse effects, the draft recovery plan and Suisun Marsh Plan advocate strongly for restoration of tidal wetlands through the conversion of managed wetlands. These plans are based on the premise that managed wetlands are at high risk of loss of salt marsh harvest mouse habitat from a variety of factors, including flooding from levee failure and cessation of active management (which is often necessary to maintain habitat values in managed wetlands). Therefore, the temporary effects under Alternative 4 would be consistent with those deemed acceptable in the draft recovery plan for salt marsh harvest mouse and the Suisun Marsh Plan.
- To ensure that temporal loss as a result of tidal natural communities restoration does not adversely affect the salt marsh harvest mouse population, restoration in Suisun Marsh would be carefully phased over time to offset adverse effects of restoration as it occurs, ensure that short-term population loss is relatively small and incremental, and maintain local source populations to recolonize newly restored areas. The tidal restoration projects in Suisun Marsh would be implemented in 150-acre or greater patches that provide viable habitat areas for the salt marsh harvest mouse habitat consistent with the draft tidal marsh recovery plan (U.S. Fish and Wildlife Service 2010).
- The salt marsh harvest mouse population would be monitored during the phasing process, and adaptive management would be applied to ensure maintenance of Suisun Marsh population as described in BDCP Chapter 6, *Implementation*.

Because there would be no project-level effects on salt marsh harvest mouse resulting from CM1, the analysis of the effects of conservation actions does not include a comparison with standard ratios used for NEPA analyses.

The Plan also includes commitments to implement AMM1 Worker Awareness Training, AMM2 Construction Best Management Practices and Monitoring, AMM3 Stormwater Pollution Prevention Plan, AMM4 Erosion and Sediment Control Plan, AMM5 Spill Prevention, Containment, and Countermeasure Plan, AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan, and AMM27 Salt Marsh Harvest Mouse and Suisun Shrew. All of these AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas. The AMMs are described in detail in BDCP Appendix 3.C.

The effects on salt marsh harvest mouse habitat from Alternative 4 in the near-term represent an adverse effect as a result of habitat modification of a special-status species and potential for direct mortality in the absence of other conservation actions. However, with habitat protection, restoration, and management and enhancement associated with CM3, CM4, CM8 and CM11, guided by species-specific goals and objectives and AMM1–AMM6, AMM10, and AMM27, which would be in place throughout the construction phase, the effects of Alternative 4 during the near-term on salt marsh harvest mouse would not be adverse under NEPA. Alternative 4 with the use of the alternative transmission line alignment would have the same effects as the proposed transmission line alignment and thus would also not be adverse under NEPA.

Late Long-Term Timeframe

Based on modeled habitat, the study area supports approximately 35,064 acres of salt marsh harvest mouse modeled habitat. Alternative 4 as a whole would result in effects to 6,962 acres of saltmarsh harvest mouse modeled habitat over the term of the Plan, which would include 5,376 acres of permanent losses and 1,587 acres of habitat conversions. These effects (loss and conversion) would be to 20% of the modeled habitat in the plan area. Most of these effects (99%) would be to managed wetlands, which though are known to be occupied by salt marsh harvest mouse are at high risk of catastrophic flooding and have lower long-term conservation value than tidal wetlands (U.S. Fish and Wildlife Service 2010). Effects on up to 20% of the species' habitat in the Plan Area may diminish the salt marsh harvest mouse population in the Plan Area and result in reduced genetic diversity, thereby putting the local population at risk of local extirpation due to random environmental fluctuations or catastrophic events. This effect is expected to be greatest if large amounts of habitat are removed at one time in Suisun Marsh and are not effectively restored for many years, and if there are no adjacent lands with salt marsh harvest mouse populations to recolonize restored areas.

The Plan includes a commitment to restore or create 3,000 acres of tidal brackish emergent wetland (CM4), the protection of 6,500 acres of managed wetlands, 1,500 acres of which would be specifically managed for salt marsh harvest mouse (CM3), and the protection and/or restoration of grassland adjacent to tidal restoration (areas within 200 feet of tidal restoration) to provide upland refugia for salt marsh harvest mouse (CM3 and CM8). Other factors relevant to effects on salt marsh harvest mouse include:

- Tidal restoration actions would not immediately displace salt marsh harvest mouse in managed wetlands as noted in the draft recovery plan for salt marsh harvest mouse because the conversion of managed wetland to tidal marsh would be gradual. Tidal marsh restoration is often accomplished by breaching levees and converting diked nontidal marsh currently occupied by salt marsh harvest mouse to tidal wetlands, their historic condition. Conversion of these subsided areas requires sedimentation and accretion over time to restore marsh plains, resulting in a prolonged period (sometimes a decade or more) in which resident mice populations are displaced by uninhabitable aquatic areas (U.S. Fish and Wildlife Service 2010). Despite these temporary adverse effects, the draft recovery plan and Suisun Marsh Plan advocate strongly for restoration of tidal wetlands through the conversion of managed wetlands. These plans are based on the premise that managed wetlands are at high risk of loss of salt marsh harvest mouse habitat from a variety of factors, including flooding from levee failure and cessation of active management (which is often necessary to maintain habitat values in managed wetlands). Therefore, the temporary effects under BDCP are consistent with those deemed acceptable in the draft recovery plan for salt marsh harvest mouse and the Suisun Marsh Plan.
- In order to ensure that temporal loss as a result of tidal natural communities restoration does not adversely affect the salt marsh harvest mouse population, restoration in Suisun Marsh would be carefully phased over time to offset adverse effects of restoration as it occurs, ensure

that short-term population loss is relatively small and incremental, and maintain local source populations to recolonize newly restored areas. The tidal restoration projects in Suisun Marsh would be implemented in 150-acre or greater patches that provide viable habitat areas for the salt marsh harvest mouse habitat consistent with the draft tidal marsh recovery plan (U.S. Fish and Wildlife Service 2010).

- The salt marsh harvest mouse population would be monitored during the phasing process and adaptive management would be applied to ensure maintenance of Suisun Marsh population as described in BDCP Chapter 6, *Implementation*.
- The habitat that would be restored and protected would consist of large blocks of contiguous tidal brackish emergent wetland that has a large proportion of pickleweed-dominated vegetation suitable for the species. This would provide greater habitat connectivity and greater habitat value, which is expected to accommodate larger populations and to therefore increase population resilience to random environmental events and climate change.

The effects to salt marsh harvest mouse habitat from Alternative 4 as a whole would represent an adverse effect as a result of habitat modification of a special-status species and potential for direct mortality in the absence of other conservation actions. However, with habitat protection, restoration, and management and enhancement associated with CM3, CM4, CM8 and CM11, guided by species-specific goals and objectives and AMM1–AMM6, AMM10 and AMM27, which would be in place throughout the time period any construction activity would be occurring, the effects of Alternative 4 as a whole on salt marsh harvest mouse would not be adverse under NEPA. Alternative 4 with the use of the alternative transmission line alignment would have the same effects as the proposed transmission line alignment and thus would also not be adverse under NEPA.

CEQA Conclusion:

Near-Term Timeframe

The near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection and/or restoration in an appropriate timeframe to ensure that the effects of near-term covered activities would be less than significant under CEQA. The Plan would affect 2,465 acres of salt marsh harvest mouse modeled habitat in the study area in the near-term. These effects include 1,517 acres of permanent loss and 948 acres of converted habitat. Most of the habitat converted would be to primary habitats (599 acres consisting of 64 acres of tidal brackish emergent wetland and 534 acres of managed wetland) converted to secondary tidal brackish emergent wetland.

The BDCP has committed to near-term goals of restoring 1,000 acres of tidal brackish emergent wetland, the protection and/or restoration of grasslands within 200 feet of restored tidal wetlands, and the protection and enhancement of 3,200 acres of managed wetlands (1,500 acres of which would be specifically managed for salt marsh harvest mouse). Though there would be a net loss of modeled habitat, all of these losses are to managed wetlands, which according to the U.S. Fish and Wildlife Service are at high risk of catastrophic flooding (U.S. Fish and Wildlife Service 2010) and have lower long-term conservation value than tidal wetlands. The species-specific biological goals and objectives would inform the near-term protection and restoration efforts. These Plan goals represent performance standards for considering the effectiveness of restoration actions. The acres of protection and restoration contained in the near-term Plan goals would keep pace with the loss of habitat and effects to salt marsh harvest mouse habitat.

Other factors relevant to effects on salt marsh harvest mouse are listed below.

- Tidal restoration actions would not immediately displace salt marsh harvest mouse in managed wetlands as noted in the draft recovery plan for salt marsh harvest mouse because the conversion of managed wetland to tidal marsh would be gradual. Tidal marsh restoration is often accomplished by breaching levees and converting diked nontidal marsh currently occupied by salt marsh harvest mouse populations to tidal wetlands, their historic condition. Conversion of these subsided areas requires sedimentation and accretion over time to restore marsh plains, resulting in a prolonged period (sometimes a decade or more) in which resident mice populations are displaced by uninhabitable aquatic areas (U.S. Fish and Wildlife Service 2010). Despite these temporary adverse effects, the draft recovery plan and Suisun Marsh Plan advocate strongly for restoration of tidal wetlands through the conversion of managed wetlands. These plans are based on the premise that managed wetlands are at high risk of loss of salt marsh harvest mouse habitat from a variety of factors, including flooding from levee failure and cessation of active management (which is often necessary to maintain habitat values in managed wetlands). Therefore, the temporary impacts under Alternative 4 would be consistent with those deemed acceptable in the draft recovery plan for salt marsh harvest mouse and the Suisun Marsh Plan.
- To ensure that temporal loss as a result of tidal natural communities restoration does not adversely affect the salt marsh harvest mouse population, restoration in Suisun Marsh would be carefully phased over time to offset adverse effects of restoration as it occurs, ensure that short-term population loss is relatively small and incremental, and maintain local source populations to recolonize newly restored areas. The tidal restoration projects in Suisun Marsh would be implemented in 150-acre or greater patches that provide viable habitat areas for the salt marsh harvest mouse habitat consistent with the draft tidal marsh recovery plan (U.S. Fish and Wildlife Service 2010).
- The salt marsh harvest mouse population would be monitored during the phasing process, and adaptive management would be applied to ensure maintenance of Suisun Marsh population as described in BDCP Chapter 6, *Implementation*.

Because there would be no project-level impacts on salt marsh harvest mouse resulting from CM1, the analysis of the impacts of conservation actions does not include a comparison with standard ratios used for project-level CEQA analyses.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training, AMM2 Construction Best Management Practices and Monitoring, AMM3 Stormwater Pollution Prevention Plan, AMM4 Erosion and Sediment Control Plan, AMM5 Spill Prevention, Containment, and Countermeasure Plan, AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan, AMM7 Barge Operations Plan, and AMM27 Salt Marsh Harvest Mouse and Suisun Shrew*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas. The AMMs are described in detail in BDCP Appendix 3.C.

These commitments are more than sufficient to support the conclusion that the near-term effects of Alternative 4 would be less than significant under CEQA. Alternative 4 with the east-west transmission line alignment would have the same effects and thus would also be less-than significant under CEQA.

Late Long-Term Timeframe

Based on modeled habitat, the study area supports approximately 35,064 acres of salt marsh harvest mouse modeled habitat. Alternative 4 as a whole would result in effects to 6,962 acres of saltmarsh harvest mouse modeled habitat over the term of the Plan, which would include 5,376 acres of permanent losses and 1,587 acres of habitat conversions. The Plan includes a commitment to restore or create 3,000 acres of tidal brackish emergent wetland (CM4), the protection of 6,500 acres of managed wetlands, 1,500 acres of which would be specifically managed for salt marsh harvest mouse (CM3), and the protection and/or restoration of grassland adjacent to tidal restoration (areas within 200 feet of tidal restoration) to provide upland refugia for salt marsh harvest mouse (CM3 and CM8). Other factors relevant to effects on salt marsh harvest mouse include:

- Tidal restoration actions would not immediately displace salt marsh harvest mouse in managed wetlands as noted in the draft recovery plan for salt marsh harvest mouse because the conversion of managed wetland to tidal marsh would be gradual. Tidal marsh restoration is often accomplished by breaching levees and converting diked nontidal marsh currently occupied by salt marsh harvest mouse populations to tidal wetlands, their historic condition. Conversion of these subsided areas requires sedimentation and accretion over time to restore marsh plains, resulting in a prolonged period (sometimes a decade or more) in which resident mice populations are displaced by uninhabitable aquatic areas (U.S. Fish and Wildlife Service 2010). Despite these temporary adverse effects, the draft recovery plan and Suisun Marsh Plan advocate strongly for restoration of tidal wetlands through the conversion of managed wetlands. These plans are based on the premise that managed wetlands are at high risk of loss of salt marsh harvest mouse habitat from a variety of factors, including flooding from levee failure and cessation of active management (which is often necessary to maintain habitat values in managed wetlands). Therefore, the temporary effects under BDCP are consistent with those deemed acceptable in the draft recovery plan for salt marsh harvest mouse and the Suisun Marsh Plan.
- In order to ensure that temporal loss as a result of tidal natural communities restoration does not adversely affect the salt marsh harvest mouse population, restoration in Suisun Marsh would be carefully phased over time to offset adverse effects of restoration as it occurs, ensure that short-term population loss is relatively small and incremental, and maintain local source populations to recolonize newly restored areas. The tidal restoration projects in Suisun Marsh would be implemented in 150-acre or greater patches that provide viable habitat areas for the salt marsh harvest mouse habitat consistent with the draft tidal marsh recovery plan (U.S. Fish and Wildlife Service 2010).
- The salt marsh harvest mouse population would be monitored during the phasing process and adaptive management would be applied to ensure maintenance of Suisun Marsh population as described in BDCP Chapter 6, Implementation.
- The habitat that would be restored and protected would consist of large blocks of contiguous tidal brackish emergent wetland that has a large proportion of pickleweed-dominated vegetation suitable for the species. This would provide greater habitat connectivity and greater habitat value, which is expected to accommodate larger populations and to therefore increase population resilience to random environmental events and climate change.

Alternative 4 would result in substantial habitat modifications to salt marsh harvest mouse habitat in the absence of other conservation actions. However, with habitat protection, restoration associated, and management and enhancement with CM3, CM4, CM8 and CM11, guided by species-specific goals and objectives and AMM1–AMM7, AMM10 and AMM27, which would be in place throughout the time period any construction activity would be occurring, Alternative 4 over the term of the BDCP would not result in a substantial adverse effect through habitat modifications and would not substantially reduce the number or restrict the range of the species. Therefore, the alternative would have a less-than-significant impact on salt marsh harvest mouse. Alternative 4 with the use of the alternative transmission line alignment would have the same effects as the proposed transmission line alignment and thus also have a less-than significant impact on the species.

Impact BIO-159: Indirect effects of plan implementation on salt marsh harvest mouse

Construction/disturbance activities associated tidal restoration (CM4), grassland restoration (CM8), and management and enhancement activities (CM11) could result in temporary noise and visual disturbances to salt marsh harvest mouse occurring within 100 feet of these areas over the term of the BDCP. These potential adverse effects would be minimized or avoided through AMM1–AMM6, and AMM27, which would be in effect throughout the term of the Plan.

The use of mechanical equipment during the implementation of the conservation measures could cause the accidental release of petroleum or other contaminants that could affect salt marsh harvest mouse and its habitat. The inadvertent discharge of sediment could also have a negative effect on the species and its habitat. AMM1–AMM6 would minimize the likelihood of such spills occurring and would ensure measures are in place to prevent runoff from the construction area and potential adverse effects of sediment on salt marsh harvest mouse.

Covered activities have the potential to exacerbate bioaccumulation of mercury in covered species that feed in aquatic environments. Exposure to methylmercury is known to affect mammals and thus potentially could adversely affect the salt marsh harvest mouse. The operational impacts of new flows under BDCP were analyzed using a DSM-2 based model to assess potential effects on mercury concentration and bioavailability. Subsequently, a regression model was used to estimate fish-tissue concentrations under these future operational conditions (evaluated starting operations or ESO). Results indicated that changes in total mercury levels in water and fish tissues due to ESO were insignificant (see BDCP Appendix D Tables).

Marsh (tidal and nontidal) and floodplain restoration also have the potential to increase exposure to methylmercury. Mercury is transformed into the more bioavailable form of methylmercury in aquatic systems, especially areas subjected to regular wetting and drying such as tidal marshes and flood plains. Thus, BDCP restoration activities that create newly inundated areas could increase bioavailability of mercury. Increased methylmercury associated with natural community and floodplain restoration may indirectly affect salt marsh harvest mouse, via uptake in lower tropic levels (BDCP Appendix 5.D, Contaminants). In general, the highest methylation rates are associated with high tidal marshes that experience intermittent wetting and drying and associated anoxic conditions (Alpers et al. 2008). The potential mobilization or creation of methylmercury within the Plan Area varies with site-specific conditions and would need to be assessed at the project level. The Suisun Marsh Plan (Bureau of Reclamation et al. 2010) anticipates that tidal wetlands restored under the plan would generate less methylmercury than the existing managed wetlands. *CM12 Methylmercury Management* includes provisions for project-specific Mercury Management Plans. Along with minimization and mitigation measures and adaptive management and monitoring, CM12 is expected to reduce the effects of methylmercury resulting from BDCP natural communities and floodplain restoration on salt marsh harvest mouse. Currently, it is unknown if or how much of the sediment-derived methylmercury enters the food chain or what tissue concentrations are harmful to the salt marsh harvest mouse. The potential adverse effects associated with any increased exposure are considered low because methylmercury occurs naturally in the habitats in which the species has evolved, because the species is relatively low in the food chain, and because the species' short life span likely precludes it from bioaccumulating mercury to lethal levels.

Implementation of the AMMs listed above as part of implementing BDCP Alternative 4 would avoid the potential for substantial adverse effects on salt marsh harvest mouse, either indirectly or through habitat modifications. These AMMs would also avoid and minimize effects that could substantially reduce the number of salt marsh harvest mouse, or restrict the species' range. Therefore, the indirect effects of Alternative 4 would not have an adverse effect on salt marsh harvest mouse. Alternative 4 with the use of the alternative transmission line alignment would have the same effects as the proposed transmission line alignment and thus also not have an adverse effect on the species.

CEQA Conclusion: Indirect effects from construction-related noise and visual disturbances could impact salt marsh harvest mouse within 100 feet of these disturbances. The use of mechanical equipment during construction could cause the accidental release of petroleum or other contaminants that could impact salt marsh harvest mouse and its habitat. The inadvertent discharge of sediment adjacent to salt marsh harvest mouse habitat could also impact the species. With implementation of AMM1–AMM6, and AMM27 as part of Alternative 4 construction, operation and maintenance, the BDCP would avoid the potential for substantial adverse effects on salt marsh harvest mouse, either indirectly or through habitat modifications, in that the BDCP would not result in a substantial reduction in numbers or a restriction in the range of salt marsh harvest mouse. The indirect effects of BDCP Alternative 4 would have a less-than-significant impact on salt marsh harvest mouse.

Salt marsh harvest mouse could experience indirect effects from increased exposure to methylmercury as a result of tidal habitat restoration (CM4). With implementation of CM12, the potential indirect effects of methlymercury would not result in a substantial reduction in numbers or a restriction in the range of salt marsh harvest mouse, and, therefore, would have a less-than-significant impact on the species. Alternative 4 with the use of the alternative transmission line alignment would have the same effects as the proposed transmission line alignment and thus also have a less-than significant impact on the species.

Suisun Shrew

This section describes the effects of Alternative 4, including water conveyance facilities construction and implementation of other conservation components, on the Suisun shrew. Primary Suisun shrew habitat consists of all *Salicornia*-dominated natural seasonal wetlands and certain *Scirpus* and *Typha* communities found within Suisun Marsh only. Low marsh dominated by *Schoenoplectus acutus* and *S. californicus* and upland transitional zones within 150 feet of the tidal wetland edge were classified separately as secondary habitat because they are used seasonally (Hays and Lidicker 2000). All managed wetlands were excluded from the habitat model. Construction and restoration associated with Alternative 4 conservation measures would result in effects to modeled Suisun shrew habitat, which would include permanent losses and habitat conversions (i.e., existing habitat converted to greater or lesser valued habitat for the species post-restoration) as indicated in Table 12-4-57. All of the effects to the species would take place over an extended period of time as tidal marsh is restored in the Plan Area. Full implementation of Alternative 4 would restore or create 3,000 acres of tidal brackish emergent wetland (CM4) and the protection and/or restoration of grassland adjacent to tidal restoration (areas within 200 feet of tidal restoration of which approximately 150 feet of this area will benefit the species) to provide upland refugia for Suisun shrew (CM3 and CM8). Alternative 4 with the use of the alternative transmission line alignment would have the same effects as the proposed transmission line alignment. As explained below, with the restoration or protection of these amounts of habitat, impacts on the Suisun shrew would not be adverse for NEPA purposes and would be less than significant for CEQA purposes for both transmission line options under Alternative 4.

Table 12-4-57. Changes in Suisun Shrew Modeled Habitat Associated with Alternative 4 (acres)[a]

	Conservation Measure[b]	Habitat Type	Permanent		Temporary		Periodic[d]	
			NT	LLT	NT	LLT	Yolo	Floodplain
Habitat Affected[c]	CM1	(CM1 Outside of species range)	0	0	0	0	NA	NA
	Total Impacts CM1		**0**	**0**	**0**	**0**		
	CM2–CM18	*Primary*	58	60	0	0	0	0
		Secondary	47	327	0	0	0	0
	Total Impacts CM2–CM18		**105**	**387**	**0**	**0**	**0**	**0**
	TOTAL IMPACTS		**105**	**387**	**0**	**0**	**0**	**0**
Habitat Restored/ Created[e]	CM4 Tidal Restoration–*Tidal Brackish Emergent Wetland*		1,000	3,000	NA	NA	NA	NA
	Total Restoration/Creation		**1,000**	**3,000**				
	CM3 Natural Communities Protection and Restoration–*Grasslands*		NA	unknown	NA	NA	NA	NA
	Total Protection			**unknown**				

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late long-term timeframes.

[b] See discussion below for a description of applicable CMs.

[c] LLT acreages are a summation of effects that would occur in the near-term, early long-term and late long-term timeframes. The LLT acreages represent the total amount of habitat that would be affected over the 50-year life of the BDCP and do not reflect habitat increases that would result from restoration, creation and protection activities.

[d] Periodic effects were estimated for the late long-term only. Yolo periodic impacts are presented as a range based on different flow regimes at the proposed notch in Fremont Weir.

[e] Restored/created and protected habitat acreages represent planned conservation activities that would specifically benefit the species and be implemented over the lifetime of the BDCP (see BDCP Chapter 3, *Conservation Strategy*, for specifics).

NT = near-term

LLT = late long-term

NA = not applicable

Impact BIO-160: Loss or conversion of habitat for and direct mortality of Suisun shrew

BDCP tidal restoration (CM4) would be the only conservation measure resulting in loss of habitat to Suisun shrew. Habitat enhancement and management activities (CM11), which include ground disturbance or removal of nonnative vegetation, could result in local adverse habitat effects. Each of these activities is described in detail below. A summary statement of the combined impacts and NEPA and CEQA conclusions follows the individual conservation measure discussions.

- *CM4 Tidal Natural Communities Restoration* would result in effects to 387 acres of Suisun shrew modeled habitat, which would include 378 acres of permanent losses and 9 acres of habitat conversions. Suisun shrew may be displaced temporarily from areas of converted habitat but would ultimately provide suitable habitat for the species. However, all 9 acres would be converted from secondary to primary habitat and therefore over would be net benefit to the species.
- *CM11 Natural Communities Enhancement and Management* As described in the BDCP, the restoration of at least 3,000 acres of tidal brackish emergent wetland would be managed to provide habitat for covered species, including Suisun shrew. A variety of habitat management actions included in *CM11 Natural Communities Enhancement and Management* that are designed to enhance and manage these areas may result in localized ground disturbances that could temporarily remove small amounts of Suisun shrew habitat. The protection and/or restoration of 2,000 acres of grasslands would also have enhancement and management actions that would include invasive species control, non-native wildlife control, and vegetation management. Ground-disturbing activities, such as removal of nonnative vegetation are expected to have minor effects on habitat and are expected to result in overall improvements to and maintenance of Suisun shrew habitat values over the term of the BDCP. These effects cannot be quantified, but are expected to be minimal and would be avoided and minimized by the AMMs listed below.
- Injury and Direct Mortality: The use of heavy equipment and handtools may result in injury or mortality to Suisun shrew during restoration, enhancement, and management activities. However, preconstruction surveys, construction monitoring, and other measures would be implemented to avoid and minimize injury or mortality of this species during these activities, as required by the AMM described below.

The following paragraphs summarize the combined effects discussed above and describe other BDCP conservation actions that offset or avoid these effects. NEPA and CEQA impact conclusions are also included.

Near-Term Timeframe

The near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection and/or restoration in an appropriate timeframe to ensure that the effects of near-term covered activities would not be adverse under NEPA. The Plan would affect 105 acres of Suisun shrew modeled habitat in the study area in the near-term. These effects include 90 acres of permanent loss and 15 acres of converted habitat, which is all secondary habitat being converted to primary habitat.

The BDCP has committed to near-term goals of restoring 1,000 acres of tidal brackish emergent wetland and the protection and/or restoration of grasslands within 200 feet of restored tidal wetlands, of which approximately 150 feet of this area will benefit the species. These Plan goals represent performance standards for considering the effectiveness of restoration actions. The acres of tidal restoration and the commitment to protection of adjacent uplands contained in the near-term Plan goals would keep pace with the loss of habitat and effects on Suisun shrew.

There are three other factors relevant to effects on Suisun shrew.

- Restoration would be sequenced and oriented in a manner that minimizes any temporary, initial loss of habitat and habitat fragmentation
- The habitat that would be restored and protected would consist of large blocks of contiguous tidal brackish emergent wetland that has a large proportion of pickleweed-dominated vegetation suitable for the species. This would provide greater habitat connectivity and greater habitat value and quantity, with is expected to accommodate larger populations and to therefore increase population resilience to random environmental events and climate change.
- The amount of tidal habitat restored in the near-term (1,000 acres) would greatly exceed the amount permanently lost (105 acres).

Because there would be no project-level effects on Suisun shrew resulting from CM1, the analysis of the effects of conservation actions does not include a comparison with standard ratios used for project-level NEPA analyses.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training, AMM2 Construction Best Management Practices and Monitoring, AMM3 Stormwater Pollution Prevention Plan, AMM4 Erosion and Sediment Control Plan, AMM5 Spill Prevention, Containment, and Countermeasure Plan, AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan, AMM7 Barge Operations Plan, and AMM27 Salt Marsh Harvest Mouse and Suisun Shrew*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas. The AMMs are described in detail in BDCP Appendix 3.C.

The effects on Suisun shrew habitat from Alternative 4 in the near-term represent an adverse effect as a result of habitat modification of a special-status species and potential for direct mortality in the absence of other conservation actions. However, with habitat protection, restoration, and management and enhancement associated with CM3, CM4, CM8 and CM11, and AMM1–AMM7, AMM10 and AMM27, which would be in place throughout any construction activity, the effects of Alternative 4 on Suisun shrew in the near-term would not be adverse under NEPA. Alternative 4 with the use of the alternative transmission line alignment would have the same effects as the proposed transmission line alignment.

Late Long-Term Timeframe

Based on modeled habitat, the study area supports approximately 7,568 acres of Suisun shrew modeled habitat. Alternative 4 as a whole would result in effects to 387 acres of Suisun shrew modeled habitat over the term of the Plan, which would include 378 acres of permanent losses and 9 acres of habitat conversions. It should be noted that the acreage of converted habitat drops from 15 acres in the near-term to 9 acres in the late long-term because the areas restored in earlier time periods have been modeled to change over time due to the influence of sea level rise, natural accretion, and adjacent restoration that would influence hydrologic conditions (see BDCP Appendix 3-B, *Marsh Evolution*). So, the balance of primary and secondary habitat shifts over time as marsh restoration progresses, but the net effect to the species is captured in the total numbers presented for the late long-term.

These effects (loss and conversion) would be on 5% of the modeled habitat in the plan area. Effects on up to 5% of the species' habitat in the Plan Area may diminish the Suisun shrew population in the Plan Area and result in reduced genetic diversity, thereby putting the local population at risk of local extirpation due to random environmental fluctuations or catastrophic events. This effect is expected to be greatest if large amounts of habitat are removed at one time in Suisun Marsh and are not effectively restored for many years, and if there are no adjacent lands with Suisun shrew populations to recolonize restored areas.

The Plan includes a commitment to restore or create 3,000 acres of tidal brackish emergent wetland (CM4) and the protection and/or restoration of grassland adjacent to tidal restoration (areas within 200 feet of tidal restoration, of which approximately 150 feet would likely benefit the species) to provide upland refugia for Suisun shrew (CM3 and CM8). Other factors relevant to effects on Suisun shrew include:

Restoration would be sequenced and oriented in a manner that minimizes any temporary, initial loss of habitat and habitat fragmentation

- The habitat that would be restored and protected would consist of large blocks of contiguous tidal brackish emergent wetland that has a large proportion of pickleweed-dominated vegetation suitable for the species. This would provide greater habitat connectivity and greater habitat value and quantity, with is expected to accommodate larger populations and to therefore increase population resilience to random environmental events and climate change.
- The amount of tidal habitat restored (3,000 acres) greatly exceeds the amount permanently lost (387 acres).

The effects to Suisun shrew habitat from Alternative 4 as a whole would represent an adverse effect as a result of habitat modification of a special-status species and potential for direct mortality in the absence of other conservation actions. However, with habitat protection, restoration associated, and management and enhancement with CM3, CM4, CM8, and CM11, and AMM1–AMM7, AMM10 and AMM27, which would be in place throughout the time period any construction activity would be occurring, the effects of Alternative 4 as a whole on Suisun shrew would not be adverse under NEPA. Alternative 4 with the use of the alternative transmission line alignment would have the same effects as the proposed transmission line alignment.

CEQA Conclusion:

Near-Term Timeframe

The near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection and/or restoration in an appropriate timeframe to ensure that the effects of near-term covered activities would be less than significant under CEQA. The Plan would affect 105 acres of Suisun shrew modeled habitat in the study area in the near-term. These effects include 90 acres of permanent loss and 15 acres of converted habitat, which is all secondary habitat being converted to primary habitat.

The BDCP has committed to near-term goals of restoring 1,000 acres of tidal brackish emergent wetland and the protection and/or restoration of grasslands within 200 feet of restored tidal wetlands, of which approximately 150 feet would likely benefit the species. These Plan goals represent performance standards for considering the effectiveness of restoration actions. The acres of tidal restoration and the commitment to protection of adjacent uplands contained in the near-term Plan goals would keep pace with the loss of habitat and effects to Suisun shrew.

There are three other factors relevant to impacts on Suisun shrew.

- Restoration would be sequenced and oriented in a manner that minimizes any temporary, initial loss of habitat and habitat fragmentation
- The habitat that would be restored and protected would consist of large blocks of contiguous tidal brackish emergent wetland that has a large proportion of pickleweed-dominated vegetation suitable for the species. This would provide greater habitat connectivity and greater habitat value and quantity, with is expected to accommodate larger populations and to therefore increase population resilience to random environmental events and climate change.
- The amount of tidal habitat restored in the near term (1,000 acres) would greatly exceed the amount permanently lost (105 acres).

Because there would be no project-level impacts on Suisun shrew resulting from CM1, the analysis of the impacts of conservation actions does not include a comparison with standard ratios used for project-level CEQA analyses.

The Plan also includes commitments to implement AMM1–AMM7, AMM10 and AMM27. All of these AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas. The AMMs are described in detail in BDCP Appendix 3.C.

These commitments are more than sufficient to support the conclusion that the near-term effects of Alternative 4 would be less than significant under CEQA.

Late Long-Term Timeframe

Based on modeled habitat, the study area supports approximately 7,568 acres of Suisun shrew modeled habitat. Alternative 4 as a whole would result in effects to 387 acres of Suisun shrew modeled habitat over the term of the Plan, which would include 378 acres of permanent losses and 9 acres of habitat conversions. The Plan includes a commitment to restore or create 3,000 acres of tidal brackish emergent wetland (CM4) and the protection and/or restoration of grassland adjacent to tidal restoration (areas within 200 feet of tidal restoration, of which approximately 150 feet would likely benefit the species) to provide upland refugia for Suisun shrew (CM3 and CM8). Other factors relevant to effects on Suisun shrew include:

- Restoration would be sequenced and oriented in a manner that minimizes any temporary, initial loss of habitat and habitat fragmentation
- The habitat that would be restored and protected would consist of large blocks of contiguous tidal brackish emergent wetland that has a large proportion of pickleweed-dominated vegetation suitable for the species. This would provide greater habitat connectivity and greater habitat value and quantity, with is expected to accommodate larger populations and to therefore increase population resilience to random environmental events and climate change.
- The amount of tidal habitat restored (3,000 acres) greatly exceeds the amount permanently lost (387 acres).

Alternative 4 would result in substantial habitat modifications to Suisun shrew habitat in the absence of other conservation actions. However, with habitat protection, restoration associated, and management and enhancement with CM3, CM4, CM8, and CM11, guided by species-specific goals and objectives and AMM1–AMM7, AMM10 and AMM27, which would be in place throughout the time period any construction activity would be occurring, Alternative 4 over the term of the BDCP would not result in a substantial adverse effect through habitat modifications and would not substantially reduce the number or restrict the range of the species. Therefore, the alternative would have a less-than-significant impact on Suisun shrew. Alternative 4 with the use of the alternative transmission line alignment would have the same effects as the proposed transmission line alignment and thus also have a less-than significant impact on Suisun shrew.

Impact BIO-161: Indirect effects of plan implementation on Suisun shrew

Construction/disturbance activities associated tidal restoration (CM4), grassland restoration (CM8), and management and enhancement activities (CM11) could result in temporary noise and visual disturbances to Suisun shrew occurring within 100 feet of these areas over the term of the BDCP. These potential adverse effects would be minimized or avoided through AMM1–AMM7, and AMM27, which would be in effect throughout the term of the Plan.

The use of mechanical equipment during the implementation of the conservation measures could cause the accidental release of petroleum or other contaminants that could affect Suisun shrew and its habitat. The inadvertent discharge of sediment could also have a negative effect on the species and its habitat. AMM1–AMM6 would minimize the likelihood of such spills occurring and would ensure measures are in place to prevent runoff from the construction area and potential adverse effects of sediment on Suisun shrew.

Covered activities have the potential to exacerbate bioaccumulation of mercury in covered species. Exposure to methylmercury is known to affect mammals and could adversely affect the Suisun shrew. The operational impacts of new flows under CM1 were analyzed using a DSM-2-based model to assess potential effects on mercury concentration and bioavailability. Subsequently, a regression model was used to estimate fish-tissue concentrations under these future operational conditions (evaluated starting operations or ESO). Results indicated that changes in total mercury levels in water and fish tissues due to ESO were insignificant (see BDCP Appendix 5.D Tables 5D.4-3, 5D.4-4, and 5D.4-5).

Marsh (tidal and nontidal) and floodplain restoration also have the potential to increase exposure to methylmercury. Mercury is transformed into the more bioavailable form of methylmercury in aquatic systems, especially areas subjected to regular wetting and drying such as tidal marshes and flood plains. Thus, BDCP restoration activities that create newly inundated areas could increase bioavailability of mercury (see BDCP Chapter 3, *Conservation Strategy*, for details of restoration). Increased methylmercury associated with natural community and floodplain restoration may indirectly affect Suisun shrew, via uptake in lower tropic levels (Appendix 5.D, *Contaminants*). In general, the highest methylation rates are associated with high tidal marshes that experience intermittent wetting and drying and associated anoxic conditions (Alpers et al. 2008). The potential mobilization or creation of methylmercury within the Plan Area varies with site-specific conditions and would need to be assessed at the project level. The Suisun Marsh Plan (Bureau of Reclamation et al. 2010) anticipates that tidal wetlands restored under the plan would generate less methylmercury than the existing managed wetlands. *CM12 Methylmercury Management* include provisions for project-specific Mercury Management Plans. Along with minimization and mitigation measures and adaptive management and monitoring, CM12 is expected to reduce the effects of methylmercury resulting from BDCP natural communities and floodplain restoration on Suisun shrew.

For short-lived small mammals such as shrews, which lives approximately 16 months, mercury bioaccumulation is generally not of concern because the species feeds low on the food chain and generally does not live long enough to bioaccumulate toxic concentrations of mercury except when they occur in highly toxic sites. Toxic concentrations of methylmercury have been found in the kidneys of shrews that inhabit contaminated sites and forage on earthworms and other prey that live within contaminated sediments (Talmage and Walton 1993; Hinton and Veiga 2002). Hays (1990) found Suisun shrews to eat mostly isopods and amphipods, two aquatic prey types less likely to harbor methylmercury concentrations compared to a benthic organism (e.g., polychaetes). Therefore, the indirect effects of potential increases to mercury exposure are expected to be negligible.

Implementation of the AMMs listed above as part of implementing BDCP Alternative 4 would avoid the potential for substantial adverse effects on Suisun shrew, either indirectly or through habitat modifications. These AMMs would also avoid and minimize effects that could substantially reduce the number of Suisun shrew, or restrict the species' range. Therefore, the indirect effects of Alternative 4 would not have an adverse effect on Suisun shrew. Alternative 4 with the use of the alternative transmission line alignment would have the same effects as the proposed transmission line alignment and thus also not have an adverse effect on the species.

CEQA Conclusion: Indirect effects from construction-related noise and visual disturbances could impact Suisun shrew within 100 feet of these disturbances. The use of mechanical equipment during construction could cause the accidental release of petroleum or other contaminants that could impact Suisun shrew and its habitat. The inadvertent discharge of sediment adjacent to Suisun shrew habitat could also impact the species. With implementation of AMM1–AMM7, and AMM27 as part of Alternative 4 construction, operation and maintenance, the BDCP would avoid the potential for substantial adverse effects on Suisun shrew, either indirectly or through habitat modifications, in that the BDCP would not result in a substantial reduction in numbers or a restriction in the range of Suisun shrew. The indirect effects of BDCP Alternative 4 would have a less-than-significant impact on Suisun shrew. The indirect effects of BDCP Alternative 4 with the east-west transmission line alignment would also have a less-than-significant impact on Suisun shrew.

Suisun shrew could experience indirect effects from increased exposure to methylmercury as a result of tidal habitat restoration (CM4). With implementation of CM12, the potential indirect effects of methlymercury would not result in a substantial reduction in numbers or a restriction in the range of Suisun shrew, and, therefore, would have a less-than significant impact on the species. Alternative 4 with the use of the alternative transmission line alignment would have the same effects as the proposed transmission line alignment and thus also have a less-than significant impact on the species.

San Joaquin Kit Fox and American Badger

Within the study area, the modeled habitat for the San Joaquin kit fox and potential habitat for the American badger is restricted to grassland habitat west of Clifton Court Forebay along the study area's southwestern edge, in CZs 7–10. Alternative 4 actions that could affect this habitat are limited to construction and maintenance of the water conveyance facilities in the vicinity of Clifton Court Forebay, and grassland restoration, protection and management. Separately, implementation of conservation components would result in the restoration of 136 acres of grassland within CZs 1, 8, and/or 11 (Table 12-4-58). To the extent that grassland habitat is restored in CZ 8, this action would provide grassland breeding, foraging, and dispersal habitat for the San Joaquin kit fox and American badger that is contiguous with more extensive protected habitat outside of the study area. In contrast to the removed grasslands, the grasslands to be protected, enhanced, and restored occur in areas of historical natural grassland vegetation, much of which is within the range of the San Joaquin kit fox and American badger. Additionally, BDCP conservation components would protect at least 544 acres of existing unprotected kit fox grassland breeding, foraging, and dispersal habitat in CZ 8. Even with these habitat restoration and protection measures, Alternative 4 could result in an adverse effect on American Badger. Implementation of the mitigation measure described below would reduce this potential effect to a level that is not adverse under NEPA and less than significant under CEQA.

Table 12-4-58. Changes in San Joaquin Kit Fox Modeled Habitat Associated with Alternative 4 (acres)[a]

	Conservation Measure[b]	Habitat Type	Permanent		Temporary		Periodic[d]	
			NT	LLT	NT	LLT	Yolo	Floodplain
Habitat Affected[c]	CM1	Grassland	173	173	167	167	NA	NA
	Total Impacts CM1		**173**	**173**	**167**	**167**		
	CM2–CM18	Grassland	0	0	0	0	0	0
	Total Impacts CM2–CM18		**0**	**0**	**0**	**0**	**0**	**0**
	TOTAL IMPACTS		**173**	**173**	**167**	**167**	**0**	**0**
Habitat Restored/ Created[e]	CM8: Grassland		136	136	NA	NA	NA	NA
	Total Restoration/Creation		**136**	**136**				
Habitat Protected[e]	CM3: Grassland		544	544	NA	NA	NA	NA
	Total Protection		**544**	**544**				

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late long-term timeframes.

[b] See discussion below for a description of applicable CMs.

[c] LLT acreages are a summation of effects that would occur in the near-term, early long-term and late long-term timeframes. The LLT acreages represent the total amount of habitat that would be affected over the 50-year life of the BDCP and do not reflect habitat increases that would result from restoration, creation and protection activities.

[d] Periodic effects were estimated for the late long-term only. Yolo periodic impacts are presented as a range based on different flow regimes at the proposed notch in Fremont Weir.

[e] Restored/created and protected habitat acreages represent planned conservation activities that would be implemented over the lifetime of the BDCP (see BDCP Chapter 3, *Conservation Strategy*, for specifics).

NT = near-term
LLT = late long-term
NA = not applicable

Impact BIO-162: Loss or conversion of habitat for and direct mortality of San Joaquin kit fox and American badger

Water conveyance facilities construction (CM1) under Alternative 4 would result in the permanent loss of up to 173 acres of habitat and the temporary loss of 167 acres (a total of 6% of the habitat in the study area) for the San Joaquin kit fox (Table 12-4-58). Because American badger uses grasslands for denning and foraging and shares the same geographic locations as the kit fox, effects on are anticipated to be the same as those described for San Joaquin kit fox. Habitat enhancement and management activities (CM11) could result in local adverse effects on species. In addition, construction vehicle activity could cause injury or mortality of kit foxes and badgers. A summary of the combined impacts and NEPA and CEQA conclusions follows the individual conservation measure discussions.

- *CM1 Water Facilities and Operation*: Construction of the conveyance facilities would result in the permanent loss of approximately 173 acres and the temporary loss of 167 acres of modeled San Joaquin kit fox habitat and American badger habitat. This habitat is located in areas of naturalized grassland in a highly disturbed or modified setting on lands immediately adjacent to Clifton Court Forebay, in CZ 8.

  Under the east-west transmission line option there would be 13 fewer acres of impacts on San Joaquin kit fox and American badger habitat.

- *CM11 Natural Communities Enhancement and Management*: Protection of at least 544 acres of grassland habitat in CZ 8 is expected to benefit kit fox by protecting existing breeding habitat from potential loss or degradation that otherwise could occur with future changes in existing land use. The BDCP would require the protection of grasslands in large patch sizes connected to existing large areas of grassland, habitat corridors and transition habitat areas to improve the ecological functions of the grasslands necessary to support the San Joaquin kit fox. American badger is expected to benefit in a similar fashion.

  The BDCP would require the enhancement and management of these protected existing grasslands and restored grasslands to improve their function as a natural community of plants and wildlife and for associated covered species, including San Joaquin kit fox. The BDCP also includes actions to improve rodent prey availability.

  However, management activities could result in injury or mortality of San Joaquin kit fox or American badger if individuals were present in work sites or if dens were located in the vicinity of habitat management work sites. A variety of habitat management actions included in *CM11* that are designed to enhance wildlife values on protected lands may result in localized ground disturbances that could temporarily remove small amounts of San Joaquin kit fox and American badger habitat near Clifton Court Forebay, in CZ 8. Ground-disturbing activities, such as removal of nonnative vegetation and road and other infrastructure maintenance activities, are expected to have minor effects on available habitat and are expected to result in overall improvements to and maintenance of kit fox and badger habitat values over the term of the BDCP. These effects cannot be quantified, but are expected to be minimal and would be avoided and minimized through the AMMs listed below. These AMMs would remain in effect throughout the BDCP's construction phase.

- Operations and maintenance: Ongoing maintenance of BDCP facilities would be expected to have little if any adverse effect on San Joaquin kit fox or American badger. Postconstruction operations and maintenance of the above-ground water conveyance facilities and restoration infrastructure could result in ongoing but periodic disturbances that could affect either species' use of the surrounding habitat near Clifton Court Forebay, in CZ 8. Maintenance activities would include vegetation management, levee and structure repair, and regrading of roads and permanent work areas. These effects, however, would be minimized with implementation of AMM1–AMM6, AMM10, and AMM25 and with preconstruction surveys for the American badger, as required by Mitigation Measure BIO-162, *Conduct preconstruction survey for American badger*.

- Injury and direct mortality: Construction vehicle activity may cause injury to or mortality of either species. If San Joaquin kit fox or American badger reside where activities take place (most likely in the vicinity of Clifton Court Forebay, in CZ 8), the operation of equipment for land clearing, construction, operations and maintenance, and restoration, enhancement, and management activities could result in injury to or mortality of either species. Measures would be implemented to avoid and minimize injury to or mortality of these species as described in AMM1–AMM6, AMM10, and AMM26 (see BDCP Appendix 3.C) and Mitigation Measure BIO-162.

The following paragraphs summarize the effects discussed above, describe other BDCP conservation actions that would offset or avoid these effects, and provide NEPA and CEQA impact conclusions.

Near-Term Timeframe

Because water conveyance facilities construction is being evaluated at the project level, the near-term BDCP strategy has been analyzed to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the construction effects would not be adverse under NEPA.

Under Alternative 4 there would be a loss of 340 acres of San Joaquin kit fox modeled habitat and American badger habitat from CM1. The 340-acre loss in the near-term would typically require grassland protection at a 2:1 ratio with a requirement of 680 acres. There is no restoration requirement for grassland. The BDCP near-term goal to protect 544 acres and restore 136 acres would satisfy this requirement for all near-term effects.

The effects on San Joaquin kit fox and American badger habitat from Alternative 4 as a whole would represent an adverse effect as a result of habitat modification of a special-status species and potential for direct mortality in the absence of other conservation actions. However, the effects of Alternative 4 would be not be adverse with habitat protection, restoration, and management and enhancement in addition to implementation of *AMM1 Worker Awareness Training*, *AMM2 Construction Best Management Practices and Monitoring*, *AMM3 Stormwater Pollution Prevention Plan*, *AMM4 Erosion and Sediment Control Plan*, *AMM5 Spill Prevention, Containment, and Countermeasure Plan*, *AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan*, *AMM10 Restoration of Temporarily Affected Natural Communities*, and *AMM25 San Joaquin Kit Fox* AMMs include elements that avoid or minimize the risk of construction activity affecting habitat and species adjacent to work areas and disposal sites. Remaining effects would be addressed by implementation of Mitigation Measure BIO-162. BDCP Appendix 3.C describes the AMMs in detail.

Late Long-Term Timeframe

Alternative 4 as a whole would result in the permanent loss of and temporary effects to 340 acres of modeled habitat for San Joaquin kit fox and potential habitat for American badger, all during the near-term. These effects would be offset through the plan's commitment to protecting up to 544 acres of grassland, and grassland associated with alkali seasonal wetlands and vernal pool complexes, to restoring 136 acres of grassland in the study area. The overall effect would be beneficial because the plan would result in a net increase in grassland habitat acreage in the study area.

CZ 8 supports 74% of the modeled kit fox grassland habitat in the study area, and the remainder of habitat consists of fragmented, isolated patches that are unlikely to support this species. The BDCP's commitment to protect the largest remaining contiguous habitat patches (including grasslands and the grassland component of alkali seasonal wetland and vernal pool complexes) in CZ 8 and to maintain connectivity with the remainder of the satellite population in Contra Costa County would sufficiently offset the impacts resulting from water conveyance facilities construction.

CM8 Grassland Natural Community Restoration would provide for the restoration of 136 acres of grassland within CZ 8. Implementation of CM8 would replace cultivated lands with no value to San Joaquin kit fox or American badger with grassland breeding, foraging, and dispersal habitat and, thus, is expected to benefit San Joaquin kit fox and American badger. CM8 requires that the restored grassland habitat be designed and located such that it supports habitat for associated covered species, including San Joaquin kit fox, and improves connectivity among existing patches of grassland and other natural habitats. Grassland protection would focus in particular on acquiring the largest remaining contiguous patches of unprotected grassland habitat, which are located south of SR 4 in CZ 8 (Appendix 2.A, *Covered Species Accounts*). This area connects to more than 620 acres of existing habitat that is protected under the East Contra Costa County HCP/NCCP. Grasslands in CZ 8 would also be managed and enhanced to increase prey availability and to increase mammal burrows. These burrows could benefit the San Joaquin kit fox by increasing potential den sites, which are a limiting factor for the kit fox in the northern portion of its range. Consequently, implementation of this conservation measure in CZ 8 would benefit the kit fox by addressing two major kit fox stressors, loss and fragmentation of breeding habitat (see BDCP Appendix 2.A, *Covered Species Accounts*). These species are not expected to benefit from CM8 if grassland habitat is not restored in CZ 8.

In addition, habitat enhancement and management activities (CM11) could result in local adverse effects on San Joaquin kit fox and American badger, and construction vehicle activity could result in injury or mortality of kit foxes and badgers.

The effects to San Joaquin kit fox and American badger habitat from Alternative 4 as a whole would represent an adverse effect as a result of habitat modification of a special-status species and potential for direct mortality in the absence of other conservation actions. However, with habitat protection, restoration associated, and management and enhancement with CM3, CM8, and CM11, and AMM1–AMM6, AMM10, and AMM25 and Mitigation Measure BIO-162, which would be in place throughout the time period any construction activity would be occurring, the effects of Alternative 4 as a whole on San Joaquin kit fox and American badger would not be adverse under NEPA.

CEQA Conclusion:

Near-Term Timeframe

Because water conveyance facilities construction (CM1) is being evaluated at the project level, the near-term BDCP strategy has been analyzed to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the construction effects would be less than significant for CEQA purposes.

Construction under Alternative 4 would remove 340 acres of grassland habitat for San Joaquin kit fox and American badger during the near-term. The 340-acre loss in the near-term would typically require grassland protection at a 2:1 ratio with a requirement of 680 acres. There is no restoration requirement for grassland impacts. The BDCP near-term goal to protect 544 acres and restore 136 acres would satisfy this requirement for all near-term effects.

The BDCP also contains commitments to implement AMM1–AMM6, AMM10, and AMM25, which include elements that avoid or minimize the risk of construction activity impacting habitat and species adjacent to work areas and disposal sites. Remaining effects would be addressed by implementation of Mitigation Measure BIO-162. BDCP Appendix 3.C describes the AMMs in detail.

These commitments are more than sufficient to support the conclusion that the near-term effects of Alternative 4 on San Joaquin kit fox and American badger would be less than significant under CEQA.

Late Long-Term Timeframe

Alternative 4 as a whole would result in the permanent and temporary loss of 340 acres of modeled habitat for San Joaquin kit fox, and potential habitat for American badger, all during the near-term. These impacts would be offset through the plan's commitment to protecting up to 544 acres of grassland, and grassland associated with alkali seasonal wetlands and vernal pool complexes, and to restoring 136 acres of grassland in the study area. The overall effect would be beneficial because the plan would result in a net increase in grassland habitat acreage in the study area.

CZ 8 supports 74% of the modeled kit fox grassland habitat in the study area, and the remainder of habitat consists of fragmented, isolated patches that are unlikely to support this species. The BDCP's commitment to protect the largest remaining contiguous habitat patches (including grasslands and the grassland component of alkali seasonal wetland and vernal pool complexes) in CZ 8 and to maintain connectivity with the remainder of the satellite population in Contra Costa County would sufficiently offset the impacts resulting from water conveyance facilities construction.

CM8 Grassland Natural Community Restoration would provide for the restoration of 136 acres of grassland within CZ 8. Implementation of CM8 would replace cultivated lands with no value to San Joaquin kit fox or American badger with grassland breeding, foraging, and dispersal habitat and, thus, is expected to benefit San Joaquin kit fox and American badger. CM8 requires that the restored grassland habitat be designed and located such that it supports habitat for associated covered species, including San Joaquin kit fox, and improves connectivity among existing patches of grassland and other natural habitats. Grassland protection would focus in particular on acquiring the largest remaining contiguous patches of unprotected grassland habitat, which are located south of SR 4 in CZ 8 (Appendix 2.A, *Covered Species Accounts*). This area connects to more than 620 acres of existing habitat that is protected under the East Contra Costa County HCP/NCCP. Grasslands in CZ 8 would also be managed and enhanced to increase prey availability and to increase mammal burrows. These burrows could benefit the San Joaquin kit fox by increasing potential den sites, which are a limiting factor for the kit fox in the northern portion of its range. Consequently, implementation of this conservation measure in CZ 8 would benefit the kit fox by addressing two major kit fox stressors, loss and fragmentation of breeding habitat (see BDCP Appendix 2.A, *Covered Species Accounts*). These species are not expected to benefit from CM8 if grassland habitat is not restored in CZ 8.

In addition, habitat enhancement and management activities (CM11) could result in local adverse effects on San Joaquin kit fox and American badger, and construction vehicle activity could result in injury or mortality of kit foxes and badgers.

The effects to San Joaquin kit fox and American badger habitat from Alternative 4 as a whole would represent an adverse effect as a result of habitat modification of a special-status species and potential for direct mortality in the absence of other conservation actions. However, with habitat protection, restoration associated, and management and enhancement with CM3, CM8, and CM11, and AMM1–AMM6, AMM10, and AMM25 and Mitigation Measure BIO-162, which would be in place throughout the time period any construction activity would be occurring, the effects of Alternative 4 as a whole on San Joaquin kit fox and American badger would not be significant under CEQA.

Mitigation Measure BIO-162: Conduct preconstruction survey for American badger

A qualified biologist will survey for American badger concurrent with the preconstruction survey for San Joaquin kit fox and burrowing owl. If badgers are detected, the biologist will passively relocate badgers out of the work area prior to construction if feasible. If an active den is detected within the work area, the project proponent will avoid the den until the qualified biologist determines the den is no longer active. Dens that are determined to be inactive by the qualified biologist will be collapsed by hand to prevent occupation of the den between the time of the survey and construction activities.

Impact BIO-163: Indirect effects of plan implementation on San Joaquin kit fox and American badger

Construction activities associated with water conveyance facilities, conservation components and ongoing habitat enhancement, as well as operations and maintenance of above-ground water conveyance facilities, including the transmission facilities, could result in ongoing periodic postconstruction disturbances and noise with localized effects on San Joaquin kit fox and American badger and their habitat over the term of the BDCP. These potential adverse effects would be minimized and avoided through AMM1–AMM6, AMM10, and AMM25, which would be in effect throughout the plan's construction phase, and Mitigation Measure BIO-162. Water conveyance facilities operations and maintenance activities would include vegetation and weed control, ground squirrel control, canal maintenance, infrastructure and road maintenance, levee maintenance, and maintenance and upgrade of electrical systems. While maintenance activities are not expected to remove kit fox and badger habitat, operation of equipment could disturb small areas of vegetation around maintained structures and could result in injury or mortality of individual foxes and badgers, if present.

Implementation of the AMMs listed above Alternative 4 and Mitigation Measure BIO-162, *Conduct preconstruction survey for American badger* for American badger would avoid the potential for substantial adverse effects on San Joaquin kit fox or American badger, either indirectly or through habitat modifications. These measures would also avoid and minimize effects that could substantially reduce the number of San Joaquin kit fox or American badger, or restrict either species' range. Therefore, the indirect effects of Alternative 4 would not have an adverse effect on San Joaquin kit fox or American badger.

CEQA Conclusion: Indirect effects from conservation measure operations and maintenance as well as construction-related noise and visual disturbances could impact San Joaquin kit fox and American badger. With implementation of AMM1–AMM6, AMM10, and AMM25 as part of Alternative 4 construction, operation, and maintenance, the BDCP would avoid the potential for significant adverse effects on either species, either indirectly or through habitat modifications, and would not result in a substantial reduction in numbers or a restriction in the range of either species. In addition, Mitigation Measure BIO-162 would reduce the impact of indirect effects of Alternative 4 on American badger to a less-than-significant level.

Mitigation Measure BIO-162: Conduct preconstruction survey for American badger

Please see Mitigation Measure BIO-162 under Impact BIO-162.

San Joaquin Pocket Mouse

Habitat for San Joaquin pocket mouse consists of the grassland natural community throughout the Plan Area. The species requires friable soils for burrowing. Construction and restoration associated with Alternative 4 conservation measures would result in both temporary and permanent losses of San Joaquin pocket mouse habitat as indicated in Table 12-4-59. Full implementation of Alternative 4 would restore or create 2,000 acres, and protect 8,000 acres of grassland habitat for these species (Table 12-4-59). As explained below, with the restoration or protection of these amounts of habitat, impacts on San Joaquin pocket mouse would not be adverse for NEPA purposes and would be less than significant for CEQA purposes for Alternative 4 under both transmission line options.

Table 12-4-59. Changes in San Joaquin Pocket Mouse Habitat Associated with Alternative 4 (acres)[a]

	Conservation Measure[b]	Habitat Type	Permanent		Temporary		Periodic[d]	
			NT	LLT	NT	LLT	Yolo	Floodplain
Habitat Affected[c]	CM1	Grassland	308	308	255	255	NA	NA
	Total Impacts CM1		**308**	**308**	**255**	**255**		
	CM2–CM18	Grassland	951	2,251	165	197	386–1,277	513
	Total Impacts CM2–CM18		**951**	**2,251**	**165**	**197**	**386–1,277**	**513**
	TOTAL IMPACTS		**1,259**	**2,557**	**420**	**452**	**386–1,277**	**513**
Habitat Restored/ Created[e]	CM8 grassland		1,140	2,000	NA	NA	NA	NA
	Total Restoration/Creation		**1,140**	**2,000**				
Habitat Protected[e]	CM3 grassland		2,000	8,000	NA	NA	NA	NA
	Total Protection		**2,000**	**8,000**				

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late long-term timeframes.

[b] See discussion below for a description of applicable CMs.

[c] LLT acreages are a summation of effects that would occur in the near-term, early long-term and late long-term timeframes. The LLT acreages represent the total amount of habitat that would be affected over the 50-year life of the BDCP and do not reflect habitat increases that would result from restoration, creation and protection activities.

[d] Periodic effects were estimated for the late long-term only. Yolo periodic impacts are presented as a range based on different flow regimes at the proposed notch in Fremont Weir.

[e] Restored/created and protected habitat acreages represent planned conservation activities that would be implemented over the lifetime of the BDCP (see BDCP Chapter 3, *Conservation Strategy*, for specifics).

NT = near-term

LLT = late long-term

NA = not applicable

Impact BIO-164: Loss or conversion of habitat for and direct mortality of San Joaquin pocket mouse

Alternative 4 conservation measures would result in the combined permanent and temporary loss of up to 3,009 acres of habitat for San Joaquin pocket mouse (of which 2,557 acres would be a permanent loss and 452 acres would be a temporary loss of habitat, Table 12-4-59). Conservation measures that would result in these losses are conveyance facilities and transmission line construction, and establishment and use of borrow and spoil areas (CM1), Yolo Bypass Fisheries Enhancement (CM2), Tidal Natural Communities Restoration (CM4), Seasonally Inundated Floodplain Restoration (CM5), Grassland Natural Community Restoration (CM8), Vernal Pool Natural Community and Alkali Seasonal Wetland Complex Restoration (CM9), Nontidal Marsh Restoration (CM10), and Conservation Hatcheries (CM18). The majority of habitat loss would result from CM4. Habitat enhancement and management activities (CM11), which include ground disturbance or removal of nonnative vegetation, could result in local adverse habitat effects. In addition, maintenance activities associated with the long-term operation of the water conveyance facilities and other BDCP physical facilities could degrade or eliminate San Joaquin pocket mouse habitat. Each of these individual activities is described below. A summary statement of the combined impacts and NEPA and CEQA conclusions follows the individual conservation measure discussions.

- *CM1 Water Facilities and Operation:* Construction of Alternative 4 conveyance facilities would result in the combined permanent and temporary loss of up to 563 acres of potential San Joaquin pocket mouse habitat (308 acres of permanent loss, 255 acres of temporary loss) in CZs 3-6 and CZ 8. The majority of grassland that would be removed would be in CZ 8, from the construction of the Byron Forebay. Refer to the Terrestrial Biology Map Book for a detailed view of Alternative 4 construction locations. Construction of the forebay would affect the area where there is a record of San Joaquin pocket mouse (California Department of Fish and Game 2012).

  Alternative 4 with the east-west transmission line would result in the combined permanent and temporary loss of up to 551 acres of San Joaquin pocket mouse habitat (281 acres of permanent and 270 acres of temporary), which is 12 fewer acres than Alternative 4 with the proposed transmission line alignment.

- *CM2 Yolo Bypass Fisheries Enhancement:* Construction of the Yolo bypass fisheries enhancement (CM2) would permanently remove 261 acres of potential San Joaquin pocket mouse habitat in the Yolo Bypass in CZ2. In addition, 165 acres would be temporarily removed. Most of the grassland losses would occur at the north end of the bypass below Fremont Weir, along the Toe Drain/Tule Canal, and along the west side channels.

- *CM4 Tidal Natural Communities Restoration:* Tidal habitat restoration (CM4) site preparation and inundation would permanently remove an estimated 1,506 acres of potential San Joaquin pocket mouse habitat. The majority of the losses would likely occur in the vicinity of Cache Slough, on Decker Island in the West Delta ROA, on the upslope fringes of Suisun Marsh, and along narrow bands adjacent to waterways in the South Delta ROA. Tidal restoration would directly impact and fragment remaining grassland just north of Rio Vista in and around French and Prospect Islands, and in an area south of Rio Vista around Threemile Slough.

- *CM5 Seasonally Inundated Floodplain Restoration:* Construction of setback levees to restore seasonally inundated floodplain (CM5) would permanently and temporarily remove approximately 481 acres of San Joaquin pocket mouse habitat (449 permanent, 32 temporary). These losses would be expected to occur along the San Joaquin River and other major waterways in CZ 7.

- *CM8 Grassland Natural Community Restoration* and *CM9 Vernal Pool and Alkali Seasonal Wetland Complex Restoration:* Temporary construction-related disturbance of grassland habitat would result from implementation of *CM8* and *CM9* in CZs 1, 8, and 11. However, all areas would be restored to their original or higher value habitat after the construction periods. The resulting restoration of 2,000 acres of grassland would benefit San Joaquin pocket mouse.

- *CM11 Natural Communities Enhancement and Management:* The protection of 8,000 acres of grassland for covered species is also expected to benefit San Joaquin pocket mouse by protecting existing habitats from potential loss or degradation that otherwise could occur with future changes in existing land use. Habitat management and enhancement-related activities could cause disturbance or direct mortality to San Joaquin pocket mouse if they are present near work areas.

  A variety of habitat management actions included in *CM11 Natural Communities Enhancement and Management* that are designed to enhance wildlife values in restored or protected habitats could result in localized ground disturbances that could temporarily remove small amounts of San Joaquin pocket mouse habitat. Ground-disturbing activities, such as removal of nonnative vegetation and road and other infrastructure maintenance activities, would be expected to have minor adverse effects on habitat and would be expected to result in overall improvements to and maintenance of habitat values over the term of the BDCP. Noise and visual disturbance from management-related equipment operation could temporarily displace individuals or alter the behavior of the species if adjacent to work areas. With full implementation of the BDCP, enhancement and management actions designed for western burrowing owl would also be expected to benefit these species. San Joaquin pocket mouse would benefit particularly from protection of grassland habitat against potential loss or degradation that otherwise could occur with future changes in existing land use.

- *CM18 Conservation Hatcheries:* Implementation of CM18 would remove up to 35 acres of San Joaquin pocket mouse habitat.

- Operations and Maintenance: Post-construction operation and maintenance of the above-ground water conveyance facilities and restoration infrastructure could result in ongoing but periodic disturbances that could affect San Joaquin pocket mouse use of the surrounding habitat. Maintenance activities would include vegetation management, levee and structure repair, and re-grading of roads and permanent work areas. These effects, however, would be reduced by AMMs and conservation actions as described below.

- Injury and Direct Mortality: Construction could result in direct mortality of San Joaquin pocket mouse if present in construction areas.

The following paragraphs summarize the combined effects discussed above and describe other BDCP conservation actions that offset or avoid these effects. NEPA and CEQA impact conclusions are also included.

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the effects of construction would not be adverse under NEPA. The Plan would remove 1,679 acres of San Joaquin pocket mouse habitat (1,259 permanent, 420 temporary) in the study area in the near-term. One record of San Joaquin pocket mouse near Clifton Court forebay could be affected by the construction of the new forebay. These effects would result from the construction of the water conveyance facilities (CM1, 563 acres), and implementing other conservation measures (Yolo Bypass Fisheries Enhancement [CM2] Tidal Natural Communities Restoration [CM4], Seasonally Inundated Floodplain Restoration [CM5], Grassland Natural Community Restoration [CM8], Vernal Pool and Alkali Seasonal Wetland Complex Restoration [CM9], and Conservation Hatcheries [CM18] 1,116 acres).

Typical NEPA project-level mitigation ratios for those natural communities affected by CM1 would be 2:1 protection of grassland habitat. Using these typical ratios would indicate that 1,126 acres of grassland natural communities should be protected to mitigate for the CM1 losses of 563 acres of San Joaquin pocket mouse habitat. The near-term effects of other conservation actions would remove 1,116 acres of modeled habitat, and therefore require 2,232 acres of protection of San Joaquin pocket mouse habitat using the same typical NEPA ratios (2:1 for protection).

Alternative 4 with the east-west transmission option would require 24 fewer acres of protection.

The BDCP has committed to near-term goals of protecting 2,000 acres and restoring 1,140 acres of grassland natural community in CZ 1, 2, 4, 5, 7, 8, and 11. The protection and restoration of grasslands, would result in a contiguous matrix of grassland, alkali seasonal wetland, and vernal pool natural communities which would expand habitat for San Joaquin pocket mouse and reduce the effects of current levels of habitat fragmentation. Under *CM11 Natural Communities Enhancement and Management*, San Joaquin pocket mouse would likely benefit from the management of the grasslands for general wildlife benefit.

These natural community biological goals and objectives would inform the near-term protection and restoration efforts and represent performance standards for considering the effectiveness of restoration actions for the species. The acres of protection and restoration contained in the near-term Plan goals would satisfy the typical mitigation ratios that would be applied to the project-level effects of CM1 especially considering that a large portion of the impacts to grasslands consists of thin strips of grassland along levees and that areas of grassland protection and restoration would be in large contiguous blocks.

The Plan also includes commitments to implement *AMM1 Worker Awareness Training, AMM2 Construction Best Management Practices and Monitoring, AMM3 Stormwater Pollution Prevention Plan, AMM4 Erosion and Sediment Control Plan, AMM5 Spill Prevention, Containments and Countermeasure Plan, and AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan, and AMM10 Restoration of Temporary Impacts*. All of these AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas and disposal sites. The AMMs are described in detail in BDCP Appendix 3.C.

Late Long-Term Timeframe

Based on modeled habitat, the study area supports approximately 78,624 acres of potential habitat for San Joaquin pocket mouse. Alternative 4 as a whole would result in the permanent loss of and temporary effects on 3,009 acres of grasslands that could be suitable for San Joaquin pocket mouse (4% of the habitat in the study area). The locations of these losses are described above in the analyses of individual conservation measures. The Plan includes a commitment to restore or create at least 2,000 acres of grassland in CZs 1, 8, and 11 and to protect 8,000 acres of grassland (with at least 2,000 acres protected in CZ 1, at least 1,000 acres in CZ 8, at least 2,000 acres protected in CZ 11, and the remainder distributed throughout CZs 1, 2, 4, 5, 7, 8, and 11 in the study area. All protected habitat would be managed under *CM11 Natural Communities Enhancement and Management*.

The loss of San Joaquin pocket mouse habitat associated with Alternative 4 would represent an adverse effect as a result of habitat modification of special-status species and potential for mortality in the absence of other conservation actions. However, with habitat protection and restoration associated with CM3, CM8, and CM11, guided by biological goals and objectives and AMM1–AMM6, and AMM10 which would be in place throughout the time period any construction activity would be occurring, the effects of habitat loss and potential mortality under Alternative 4 on San Joaquin pocket mouse would not be adverse under NEPA. Alternative 4 with the east-west transmission option would also not be adverse under NEPA.

CEQA Conclusion:

Near-Term Timeframe

Because the water conveyance facilities construction is being evaluated at the project level, the near-term BDCP conservation strategy has been evaluated to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the impacts of construction would be less than significant. The Plan would remove 1,679 acres of modeled (1,259 permanent, 420 temporary) habitat for San Joaquin pocket mouse in the study area in the near-term. One record of San Joaquin pocket mouse near Clifton Court forebay could be affected by the construction of the new forebay. These effects would result from the construction of the water conveyance facilities (CM1, 563 acres), and implementing other conservation measures (Yolo Bypass Fisheries Enhancement [CM2] Tidal Natural Communities Restoration [CM4], Seasonally Inundated Floodplain Restoration [CM5], Grassland Natural Community Restoration [CM8], Vernal Pool and Alkali Seasonal Wetland Complex Restoration [CM9], and Conservation Hatcheries [CM18] 1,116 acres).

Typical CEQA project-level mitigation ratios for those natural communities affected by CM1 would be 2:1 protection of grassland habitat. Using these typical ratios would indicate that 1,126 acres of grassland natural communities should be protected to mitigate for the CM1 losses of 563 acres of San Joaquin pocket mouse habitat.

Alternative 4 with the east-west transmission option would require 24 fewer acres of protection.

The BDCP has committed to near-term goals of protecting 2,000 acres and restoring 1,140 acres of grassland natural community in CZs 1, 2, 4, 5, 7, 8, and 11. The protection and restoration of grasslands, would result in a contiguous matrix of grassland, alkali seasonal wetland, and vernal pool natural communities which would expand habitat for San Joaquin pocket mouse and reduce the effects of current levels of habitat fragmentation. Under *CM11 Natural Communities Enhancement and Management*, San Joaquin pocket mouse would likely benefit from the management of the grasslands for general wildlife benefit.

These natural community biological goals and objectives would inform the near-term protection and restoration efforts and represent performance standards for considering the effectiveness of restoration actions for the species. The acres of protection and restoration contained in the near-term Plan goals would satisfy the typical mitigation ratios that would be applied to the project-level effects of CM1 especially considering that a large portion of the impacts to grasslands consists of thin strips of grassland along levees and that areas of grassland protection and restoration would be in large contiguous blocks.

The Plan also includes commitments to implement AMM1–AMM6, and AMM10. All of these AMMs include elements that avoid or minimize the risk of affecting habitats and species adjacent to work areas and disposal sites. The AMMs are described in detail in BDCP Appendix 3.C.

These commitments are more than sufficient to support the conclusion that the near-term effects of Alternative 4 would be less than significant under CEQA. Alternative 4 with the east-west transmission line alignment would have the same effects and thus would also be less-than significant under CEQA.

Late Long-Term Timeframe

Based on modeled habitat, the study area supports approximately 78,624 acres of potential habitat for San Joaquin pocket mouse. Alternative 4 as a whole would result in the permanent loss of and temporary effects to 3,009 acres of grasslands that could be suitable for San Joaquin pocket mouse (4% of the habitat in the study area). The locations of these losses are described above in the analyses of individual conservation measures. The Plan includes a commitment to restore or create at least 2,000 acres of grassland in CZ 1, 8 and 11 and to protect 8,000 acres of grassland (with at least 2,000 acres protected in CZ 1, at least 1,000 acres in CZ 8, at least 2,000 acres protected in CZ 11, and the remainder distributed throughout CZs 1, 2, 4, 5, 7, 8, and 11 in the study area. All protected habitat would be managed under CM11 Natural Communities Enhancement and Management.

Considering these protection and restoration provisions, which would provide acreages of new high-value or enhanced habitat in amounts suitable to compensate for habitats lost to construction and restoration activities, and implementation of AMM1–AMM6, and AMM10, the loss of habitat or direct mortality through implementation of Alternative 4 would not result in a substantial adverse effect through habitat modifications and would not substantially reduce the number or restrict the range of either species. Therefore, the loss of habitat or potential mortality under this alternative would have a less-than-significant impact on San Joaquin pocket mouse. Alternative 4 with the east-west transmission line alignment would also have a less-than significant impact on San Joaquin pocket mouse.

Impact BIO-165: Indirect effects of plan implementation on San Joaquin pocket mouse

Construction activities associated with water conveyance facilities, conservation components and ongoing habitat enhancement, as well as operations and maintenance of above-ground water conveyance facilities, including the transmission facilities, could result in ongoing periodic postconstruction disturbances and noise with localized effects on San Joaquin kit pocket mouse and its habitat over the term of the BDCP. These potential adverse effects would be minimized and avoided through AMM1–AMM6, and AMM10, which would be in effect throughout the plan's construction phase.

Water conveyance facilities operations and maintenance activities would include vegetation and weed control, ground squirrel control, canal maintenance, infrastructure and road maintenance, levee maintenance, and maintenance and upgrade of electrical systems. While maintenance activities are not expected to remove pocket mouse habitat, operation of equipment could disturb small areas of vegetation around maintained structures and could result in injury or mortality of individual pocket mice, if present.

Implementation of the AMMs listed above would avoid the potential for substantial adverse effects on San Joaquin pocket mouse, either indirectly or through habitat modifications. These measures would also avoid and minimize effects that could substantially reduce the number of San Joaquin pocket mouse, or restrict the species' range. Therefore, the indirect effects of Alternative 4 would not have an adverse effect on San Joaquin pocket mouse. The indirect effects of Alternative 4 with the east-west transmission line alignment would also not have an adverse effect on San Joaquin pocket mouse.

CEQA Conclusion: Indirect effects from conservation measure operations and maintenance as well as construction-related noise and visual disturbances could impact San Joaquin pocket mouse. With implementation of AMM1–AMM6, and AMM10, as part of Alternative 4 construction, operation, and maintenance, the BDCP would avoid the potential for significant adverse effects on either species, either indirectly or through habitat modifications, and would not result in a substantial reduction in numbers or a restriction in the range of the species. Therefore, the indirect effects under this alternative would have a less-than-significant impact on San Joaquin pocket mouse. Alternative 4 with the east-west transmission line alignment would also have a less-than significant impact on San Joaquin pocket mouse.

Special-Status Bat Species

Special-status bat species with potential to occur in the study area employ varied roost strategies, from solitary roosting in foliage of trees to colonial roosting in trees and artificial structures, such as tunnels, buildings, and bridges. Various roost strategies could include night roosts, maternity roosts, migration stopover, or hibernation. The habitat types used to assess effects for special-status bats roosting habitat includes valley/foothill riparian natural community, developed lands and landscaped trees, including eucalyptus, palms and orchards. Potential foraging habitat includes all riparian habitat types, cultivated lands, developed lands, grasslands, and wetlands.

Implementation of Alternative 4 would not have an adverse population-level effect on special-status bat species because most BDCP activities would enhance habitat function and value for these species. Implementation of Alternative 4 would result in an overall benefit to special-status bats within the study area through protection and restoration of their foraging and roosting habitats. Protection and restoration for special-status bat species focuses on habitats and does not include manmade structures such as bridges. BDCP actions would restore 5,000 acres of riparian roosting and foraging habitat (most of this would occur in CZ 7), and 79,071 acres of foraging habitat in natural communities and developed lands (Table 12-4-60). In addition, the BDCP would protect 750 acres of roosting habitat in CZ 7 and 62,955 acres of foraging habitat. Restored foraging habitats would replace primarily cultivated lands. Restored habitats are expected to be of higher function because the production of flying insect prey species is expected to be greater in restored wetlands and uplands on which application of pesticides would be reduced relative to affected agricultural habitats. With restoration and protection of habitat as proposed and with implementation of the mitigation measures detailed below, Alternative 4 impacts on special-status bat species would be not adverse for NEPA purposes and would be less than significant under CEQA.

Table 12-4-60. Changes in Special-Status Bat Roosting and Foraging Habitat Associated with Alternative 4[a]

Conservation	Habitat	Permanent	Temporary	Periodic[d]

	Measure[b]	Type	NT	LLT	NT	LLT	Yolo	Floodplain
Habitat Affected[c]	CM1	Roosting	193	193	165	165	NA	NA
		Foraging	5,510	5,510	1,324	1,324	NA	NA
	Total Impacts CM1		**5,703**	**5,703**	**1,489**	**1,489**	**NA**	**NA**
	CM2–CM18	Roosting	664	1,522	149	194	45–79	229
		Foraging	14,496	60,398	773	2,126	3,271–7,372	8,027
	Total Impacts CM2–CM18		**15,160**	**61,920**	**922**	**2,320**		
	TOTAL IMPACTS		**20,863**	**67,623**	**2,411**	**3,809**		
Habitat Restored/ Created[e]	CM7: Riparian (Roosting)		800	5,000	NA	NA	NA	NA
	CM3: Natural Communities restoration/wetlands (Foraging)		378	392	NA	NA	NA	NA
	CM3, 4, 5, 6, 8, 9, and 10 (Foraging)		18,258	78,679				
	Total Restoration/Creation		**18,636**	**79,071**	**NA**	**NA**	**NA**	**NA**
Habitat Protected[e]	CM3: Riparian (Roosting)		750	750	NA	NA	NA	NA
	CM3: all Natural Communities (Foraging)		20,645	62,205	NA	NA	NA	NA
	Total Protection		**21,395**	**62,955**	**NA**	**NA**	**NA**	**NA**

[a] See Appendix 12E for a detailed breakdown of conservation measure effects over the BDCP's near-term and late long-term timeframes.

[b] See discussion below for a description of applicable CMs.

[c] LLT acreages are a summation of effects that would occur in the near-term, early long-term and late long-term timeframes. The LLT acreages represent the total amount of habitat that would be affected over the 50-year life of the BDCP and do not reflect habitat increases that would result from restoration, creation and protection activities.

[d] Periodic effects were estimated for the late long-term only. Yolo periodic impacts are presented as a range based on different flow regimes at the proposed notch in Fremont Weir.

[e] Restored/created and protected habitat acreages represent planned conservation activities that would be implemented over the lifetime of the BDCP (see BDCP Chapter 3, *Conservation Strategy*, for specifics).

NT = near-term

LLT = late long-term

NA = not applicable

Impact BIO-166: Loss or conversion of habitat for and direct mortality of special-status bats

Alternative 4 conservation measures would result in the permanent loss or conversion of up 2,074 acres of roosting habitat and up to 69,358 acres of foraging habitat for special-status bats in the near-term in the study area. An unknown number of buildings, barns, trees, and bridges that provide potential roosting habitat could also be affected. Habitat enhancement and management activities (CM11) could result in local adverse effects. In addition, maintenance activities associated with the long-term operation of the water conveyance facilities and other BDCP physical facilities could affect special-status bat habitat. A summary of combined impacts and NEPA and CEQA conclusions follow the individual conservation measure discussions.

- *CM1 Water Facilities and Operation*: Construction of Alternative 4 conveyance facilities would result in the permanent loss of approximately 193 acres of roosting habitat and 5,510 acres of foraging habitat in the study area. Development of the water conveyance facilities would also result in the temporary removal of up to 165 acres of roosting habitat and up to 1,324 acres of foraging habitat for special-status bats in the study area (Table 12-4-60).

  Under the Alternative 4 east-west transmission line option there would be 4 additional acres of temporary effects on roosting habitat and 26 additional acres of temporary effects on roosting habitat. There would 164 acres less permanent impacts on foraging habitat for special-status bats.

- *CM2 Yolo Bypass Fisheries Enhancement*: Improvements in the Yolo Bypass would result in the permanent removal of approximately 1,252 acres and temporary removal of 773 acres of foraging habitat for special-status in the late long-term bats. CM2 would also result in the permanent removal of 229 acres and temporary removal of 149 acres of roosting habitat for special-status bats. The maternity colony of Mexican free-tailed bats located at both ends of the Yolo Causeway bridge could also be affected during construction for CM2. Implementation of Mitigation Measure BIO-166, *Conduct preconstruction surveys for roosting bats and implement protective measures*, would ensure that improvements in the Yolo Bypass avoid effects on roosting special-status bats.

- *CM4 Tidal Natural Communities Restoration*: Tidal habitat restoration site preparation and inundation would permanently remove approximately 56,809 acres of foraging habitat and 1,236 acres of roosting habitat for special-status bats in the late long-term (Table 12-4-60). This habitat is of low value, consisting of a small, isolated patch surrounded by cultivated lands, and the species has a relatively low likelihood of being present in these areas. The roosting habitat that would be removed consists of relatively small and isolated patches along canals and irrigation ditches surrounded by cultivated lands in the Union Island and Roberts Island areas, and several small patches along the San Joaquin River. Mitigation Measure BIO-166, *Conduct preconstruction surveys for roosting bats and implement protective measures*, requires that tidal natural communities restoration avoid effects on roosting special-status bats.

- *CM5 Seasonally Inundated Floodplain Restoration*: Levee construction associated with floodplain restoration would result in the permanent removal of an estimated 2,337 acres of foraging habitat and 57 acres if roosting habitat for special-status bats in the study area. CM5 would also result in temporary effects on 1,353 acres of foraging habitat and 45 acres of roosting habitat for special-status bats in the study area.

- *CM11 Natural Communities Enhancement and Management*: Implementation of the plan would result in an overall benefit to special-status bats within the study area through protection and restoration of their foraging and roosting habitats. The majority of affected acres would convert agricultural land to natural communities with higher potential foraging and roosting value, such as riparian, tidal and nontidal wetlands, and periodically inundated lands. Restored foraging habitats primarily would replace agricultural lands. Restored habitats are expected to be of higher function because the production of flying insect prey species is expected to be greater in restored wetlands and uplands on which application of pesticides would be reduced relative to affected agricultural habitats. Noise and visual disturbances during implementation of riparian habitat management actions could result in temporary disturbances that, if bat roost sites are present, could cause temporary abandonment of roosts. This effect would be minimized with implementation of Mitigation Measure BIO-166, *Conduct preconstruction surveys for roosting bats and implement protective measures*.

- Operations and maintenance: Ongoing facilities operation and maintenance is expected to have little if any adverse effect on special-status bats. Postconstruction operation and maintenance of the above-ground water conveyance facilities and restoration infrastructure could result in ongoing but periodic disturbances that could affect special-status bat use of the surrounding habitat in the Yolo Bypass, the Cache Slough area, and the north and south Delta (CZs 1, 2, 4, 5, 6, 7, and 8). Maintenance activities would include vegetation management, levee and structure repair, and regrading of roads and permanent work areas. These effects, however, would be minimized with implementation of the mitigation measures described below.
- Injury and direct mortality: In addition, to habitat loss and conversion, construction activities, such as grading, the movement of construction vehicles or heavy equipment, and the installation of water conveyance facilities components and new transmission lines, may result in the direct mortality, injury, or harassment of roosting special-status bats. Construction activities related to conservation components could have similar affects. Preconstruction surveys would be conducted and if roosting or maternity sites are detected, seasonal restrictions would be placed while bats are present, as described below in the mitigation measures.

The following paragraphs summarize the effects discussed above, describe BDCP conservation actions that would offset or avoid these effects, and provide NEPA and CEQA conclusions.

Near-Term Timeframe

Because water conveyance facilities construction is being evaluated at the project level, the near-term BDCP strategy has been analyzed to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the construction effects would not be adverse under NEPA.

Alternative 4 would permanently or temporarily affect 1,171 acres of roosting habitat and 22,103 acres of foraging habitat for special-status bats in the near-term as a result of implementing CM1, CM2, and CM4. Effects from CM5 would all occur in the late long-term.

Typical NEPA project-level mitigation ratios would be 1:1 for restoration or protection of the valley/foothill riparian natural community, and 1:1 for protection of cultivated lands. These ratios indicate that 1,171 acres of riparian habitat should be restored and up to 22,103 acres of foraging habitat should be protected in the near-term to mitigate for CM1 habitat losses.

Implementation of BDCP actions would result in an overall benefit to special-status bats within the study area through protection and restoration of their foraging and roosting habitats. BDCP actions in the near-term would restore 800 acres of riparian roosting and foraging habitat, and 18,636 acres of foraging habitat in natural communities and developed lands. In addition, the BDCP would protect 750 acres of riparian roosting and foraging habitat and 20,645 acres of foraging habitat. Restored foraging habitats would replace primarily cultivated lands. Restored habitats are expected to be of higher function because the production of flying insect prey species is expected to be greater in restored wetlands and uplands on which application of pesticides would be reduced relative to affected agricultural habitats. Conservation components in the near-term would sufficiently offset the adverse effects resulting from near-term effects from Alternative 4.

In addition, activities associated with natural communities enhancement and protection and with ongoing facilities operations and maintenance could affect special-status bat use of surrounding habitat and could result in harassment, injury or mortality of bats. Mitigation Measure BIO-166, described below, requires preconstruction surveys to reduce these effects.

The BDCP also contains commitments to implement *AMM1 Worker Awareness Training*, *AMM2 Construction Best Management Practices and Monitoring*, *AMM3 Stormwater Pollution Prevention Plan*, *AMM4 Erosion and Sediment Control Plan*, *AMM5 Spill Prevention, Containment, and Countermeasure Plan*, *AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan*, and *AMM10 Restoration of Temporarily Affected Natural Communities.* These AMMs include elements that avoid or minimize the risk of construction activity affecting habitat and species adjacent to work areas and disposal sites. BDCP Appendix 3.C describes the AMMs in detail.

Late Long-Term Timeframe

Alternative 4 as a whole would affect 2,074 acres of roosting habitat and 69,358 acres of foraging habitat (Table 12-4-60).

Implementation of the plan would result in an overall benefit to special-status bats within the study area through protection and restoration of their foraging and roosting habitats. The majority of affected acres would convert agricultural land to natural communities with higher potential foraging and roosting value, such as riparian, tidal and nontidal wetlands, and periodically inundated lands. Implementation of BDCP conservation components would restore 5,000 acres of riparian roosting habitat and 74,071 acres of foraging habitat in cultivated lands, riparian, grassland, vernal pool complex, tidal and nontidal marshes. Additionally, conservation components would protect 750 acres of roosting habitat (riparian) and up to 62,205 acres of foraging habitat in grassland, managed wetlands, and agricultural habitat. Restored foraging habitats primarily would replace agricultural lands. Restored habitats are expected to be of higher function because the production of flying insect prey species is expected to be greater in restored wetlands and uplands on which application of pesticides would be reduced relative to affected agricultural habitats.

Should any of the special-status bat species be detected roosting in the study area, construction of water conveyance facilities would have an adverse effect on roosting special-status bats. Noise and visual disturbances and the potential for injury or mortality of individuals associated within implementation of the restoration activities on active roosts would be minimized with implementation of Mitigation Measure BIO-166, *Conduct preconstruction surveys for roosting bats and implement protective measures*. Conservation components would sufficiently offset the adverse effects resulting from late long-term effects from CM1, CM2, CM4, and CM5.

The losses of roosting and foraging habitat for special-status bats associated with implementing Alternative 4 are not expected to result in substantial adverse effects on special-status bats, either directly or through habitat modifications and would not result in a substantial reduction in numbers or a restriction in the range of special-status bats. Mitigation Measure BIO-166 is available to address any effects on special-status bats and roosting habitat. Therefore, Alternative 4 would not adversely affect the species.

CEQA Conclusion:

Near-Term Timeframe

Because water conveyance facilities construction is being evaluated at the project level, the near-term BDCP strategy has been analyzed to determine whether it would provide sufficient habitat protection or restoration in an appropriate timeframe to ensure that the construction impacts would be less than significant for CEQA purposes.

Alternative 4 would permanently or temporarily impacts 1,171 acres of roosting habitat and 22,103 acres of foraging habitat for special-status bats in the near-term as a result of implementing CM1, CM2, and CM4. Impacts from CM5 would all occur in the late long-term.

Typical CEQA project-level mitigation ratios would be 1:1 for restoration or protection of the valley/foothill riparian natural community, and 1:1 for protection of cultivated lands. These ratios indicate that 1,171 acres of riparian habitat should be restored and up to 22,103 acres of foraging habitat should be protected in the near-term to mitigate for CM1 habitat losses.

Implementation of BDCP actions would result in an overall benefit to special-status bats within the study area through protection and restoration of their foraging and roosting habitats. BDCP actions in the near-term would restore 800 acres of riparian roosting and foraging habitat, and 18,636 acres of foraging habitat in natural communities and developed lands. In addition, the BDCP would protect 750 acres of riparian roosting and foraging habitat and 20,645 acres of foraging habitat. Restored foraging habitats would replace primarily cultivated lands. Restored habitats are expected to be of higher function because the production of flying insect prey species is expected to be greater in restored wetlands and uplands on which application of pesticides would be reduced relative to affected agricultural habitats. Conservation components in the near-term would sufficiently offset the impacts resulting from near-term effects from Alternative 4.

In addition, activities associated with natural communities enhancement and protection and with ongoing facilities operations and maintenance could affect special-status bat use of surrounding habitat and could result in harassment, injury or mortality of bats. Mitigation Measure BIO-166, described below, requires preconstruction surveys to reduce these impacts to less than significant under CEQA.

The permanent loss of foraging and roosting habitat from Alternative 4 would be mitigated through implementation of Mitigation Measure BIO-166, which would ensure there is no significant impact under CEQA on roosting special-status bats, either directly or through habitat modifications and no substantial reduction in numbers or a restriction in the range of special-status bats. The BDCP also contains commitments to implement AMM1–6 and AMM10. These AMMs include elements that avoid or minimize the risk of construction activity affecting habitat and species adjacent to work areas and disposal sites. BDCP Appendix 3.C describes the AMMs in detail.

Late Long-Term Timeframe

Alternative 4 as a whole would affect 2,074 acres of roosting habitat and 69,358 acres of foraging habitat (Table 12-4-60).

Implementation of the plan would result in an overall benefit to special-status bats within the study area through protection and restoration of their foraging and roosting habitats. The majority of affected acres would convert agricultural land to natural communities with higher potential foraging and roosting value, such as riparian, tidal and nontidal wetlands, and periodically inundated lands.

Implementation of BDCP conservation components would restore 5,000 acres of riparian roosting habitat and 74,071 acres of foraging habitat in cultivated lands, grassland, riparian, vernal pool complex, tidal and nontidal marshes. Additionally, conservation components would protect 750 acres of roosting habitat (riparian) and up to 62,205 acres of foraging habitat in grassland, managed wetlands, and agricultural habitat. Restored foraging habitats primarily would replace agricultural lands. Restored habitats are expected to be of higher function because the production of flying insect prey species is expected to be greater in restored wetlands and uplands on which application of pesticides would be reduced relative to affected agricultural habitats.

Should any of the special-status bat species be detected roosting in the study area, construction of water conveyance facilities would have an adverse effect on roosting special-status bats. Noise and visual disturbances and the potential for injury or mortality of individuals associated within implementation of the restoration activities on active roosts would be minimized with implementation of Mitigation Measure BIO-166. Conservation components would sufficiently offset the adverse effects resulting from late long-term effects from CM1, CM2, CM4, and CM5.

The permanent loss of foraging and roosting habitat from Alternative 4 would be mitigated through implementation of Mitigation Measure BIO-166, which would ensure there is no significant impact under CEQA on roosting special-status bats, either directly or through habitat modifications and no substantial reduction in numbers or a restriction in the range of special-status bats. Therefore, Alternative 4 would not result in a significant impact on special-status bats under CEQA.

Mitigation Measure BIO-166: Conduct preconstruction surveys for roosting bats and implement protective measures

The following measure was designed to avoid and minimize adverse effects on special-status bats. However, baseline data is not available or is limited on how bats use the study area, or their individual numbers and how they vary seasonally so that it is difficult to determine if there would be a substantial reduction in species numbers. Bat species with potential to occur in the study area employ varied roost strategies, from solitary roosting in foliage of trees to colonial roosting in trees and artificial structures, such as buildings and bridges. Daily and seasonal variations in habitat use are common. To obtain the highest likelihood of detection, preconstruction bat surveys will include these components.

- Identification of potential roosting habitat within project area.
- Daytime search for bats and bat sign in and around identified habitat.
- Evening emergence surveys at potential day-roost sites, using night-vision goggles and/or active full-spectrum acoustic monitoring where species identification is sought.
- Passive full-spectrum acoustic monitoring and analysis to detect bat use of the area from dusk to dawn over multiple nights.
- Additional on-site night surveys as needed following passive acoustic detection of special status bats to determine nature of bat use of the structure in question (e.g., use of structure as night roost between foraging bouts).
- Qualified biologists will have knowledge of the natural history of the species that could occur in the study area and experience using full-spectrum acoustic equipment. During surveys, biologists will avoid unnecessary disturbance of occupied roosts.

Preconstruction Bridges and Other Structure Surveys

Before work begins on the bridge/structure, qualified biologists will conduct a daytime search for bat sign and evening emergence surveys to determine if the bridge/structure is being used as a roost. Biologists conducting daytime surveys would listen for audible bat calls and would use naked eye, binoculars, and a high-powered spotlight to inspect expansion joints, weep holes, and other bridge features that could house bats. Bridge surfaces and the ground around the bridge/structure would be surveyed for bat sign, such as guano, staining, and prey remains.

Evening emergence surveys will consist of at least one biologist stationed on each side of the bridge/structure watching for emerging bats from a half hour before sunset to 1–2 hours after sunset for a minimum of two nights within the season that construction would be taking place. Night-vision goggles and/or full-spectrum acoustic detectors shall be used during emergence surveys to assist in species identification. All emergence surveys would be conducted during favorable weather conditions (calm nights with temperatures conducive to bat activity and no precipitation predicted).

Additionally, passive monitoring with full-spectrum bat detectors will be used to assist in determining species present. A minimum of four nights of acoustic monitoring surveys will be conducted within the season that the construction would be taking place. If site security allows, detectors should be set to record bat calls for the duration of each night. To the extent possible, all monitoring will be conducted during favorable weather conditions (calm nights with temperatures conducive to bat activity and no precipitation predicted). The biologists will analyze the bat call data using appropriate software and prepare a report with the results of the surveys. If acoustic data suggest that bats may be using the bridge/structure as a night roost, biologists will conduct a night survey from 1–2 hours past sunset up to 6 hours past sunset to determine if the bridge is serving as a colonial night roost.

If suitable roost structures would be removed, additional surveys may be required to determine how the structure is used by bats, whether it is as a night roost, maternity roosts, migration stopover, or for hibernation.

Preconstruction Tree Surveys

If tree removal or trimming is necessary, qualified biologists will examine trees to be removed or trimmed for suitable bat roosting habitat. High-value habitat features (large tree cavities, basal hollows, loose or peeling bark, larger snags, palm trees with intact thatch, etc.) will be identified and the area around these features searched for bats and bat sign (guano, culled insect parts, staining, etc.). Riparian woodland, orchards, and stands of mature broadleaf trees should be considered potential habitat for solitary foliage roosting bat species.

If bat sign is detected, biologists will conduct evening visual emergence survey of the source habitat feature, from a half hour before sunset to 1–2 hours after sunset for a minimum of two nights within the season that construction would be taking place. Methodology should follow that described above for the bridge emergence survey.

Additionally, if suitable tree roosting habitat is present, acoustic monitoring with a bat detector will be used to assist in determining species present. These surveys would be conducted in coordination with the acoustic monitoring conducted for the bridge/structure.

Protective Measures for Bats using Bridges/Structures and Trees

Avoidance and minimization measures may be necessary if it is determined that bats are using the bridge/structure or trees as roost sites and/or sensitive bats species are detected during acoustic monitoring. Appropriate measures will be determined in coordination with CDFW and may include measures listed below.

- Disturbance of the bridge will be avoided between April 15 and September 15 (the maternity period) to avoid impacts on reproductively active females and dependent young.
- Installation of exclusion devices from March 1 through April 14 or September 15 through October 30 to preclude bats from occupying the bridge during construction. Exclusionary devices will only be installed by or under the supervision of an experienced bat biologist.
- Tree removal will be avoided between April 15 and September 15 (the maternity period) to avoid impacts on pregnant females and active maternity roosts (whether colonial or solitary).
- All tree removal will be conducted between September 15 and October 30, which corresponds to a time period when bats have not yet entered torpor or would be caring for non-volant young.
- Trees will be removed in pieces, rather than felling the entire tree.
- If a maternity roost is located, whether solitary or colonial, that roost will remain undisturbed until September 15 or until a qualified biologist has determined the roost is no longer active.
- If avoidance of non-maternity roost trees is not possible, and tree removal or trimming must occur between October 30 and September 15, qualified biologists will monitor tree trimming/removal. Prior to removal/trimming, each tree will be gently shaken and several minutes should pass before felling trees or trimming limbs to allow bats time to arouse and leave the tree. The biologists should search downed vegetation for dead and injured bats. The presence of dead or injured bats that are species of special concern will be reported to CDFW.

Compensatory mitigation for the loss of roosting habitat will also be determined through consultation with CDFW and may include the construction and installation of suitable replacement habitat (e.g., bat houses, planting cottonwood trees) onsite.

Impact BIO-167: Indirect effects of plan implementation on special-status bats

Construction activities associated with water conveyance facilities, conservation components and ongoing habitat enhancement, as well as operations and maintenance of above-ground water conveyance facilities, including the transmission facilities, could result in ongoing periodic postconstruction disturbances and noise with localized effects on special-status bats and their roosting habitat over the term of the BDCP.

Water conveyance facilities operations and maintenance activities would include vegetation and weed control, ground squirrel control, canal maintenance, infrastructure and road maintenance, levee maintenance, and maintenance and upgrade of electrical systems. While maintenance activities are not expected to remove special-status bat habitat, operation of equipment could disturb small areas of vegetation around maintained structures and could result in disturbances to roosting bats, if present. Mitigation Measure BIO-166, *Conduct preconstruction surveys for roosting bats and implement protective measures*, is available to address these potential adverse effects.

Increased exposure to methylmercury associated with tidal natural communities restoration would potentially indirectly affect special-status bat species. *CM12 Methylmercury Management* describes the process by which tidal natural communities restoration may increase methyl mercury levels in wetlands in the study area. Mercury has been found in high concentrations in some bat species, such as the Indiana bat. Many bat species forage heavily on aquatic insects, which might result in rapid bioaccumulation (Biodiversity Research Institute 2012). Measures described in *CM12 Methylmercury Management* are expected to reduce the effects of methylmercury on special-status bat species resulting from BDCP tidal natural communities restoration.

Implementation of the Mitigation Measure BIO-166 for special-status bats would avoid the potential for substantial adverse effects on roosting special-status bats, either indirectly or through habitat modifications. This mitigation measure would also avoid and minimize effects that could substantially reduce the number of special-status bats, or restrict species' range. Therefore, the indirect effects of Alternative 4 would not have an adverse effect on special-status bats.

CEQA Conclusion: Indirect effects from conservation components operations and maintenance as well as construction-related noise and visual disturbances could have a significant impact on special-status bat species, either indirectly or through habitat modifications. Mitigation Measure BIO-166 would reduce this impact to a less-than-significant level and ensure Alternative 4 would not result in a substantial reduction in numbers or a restriction in the range of species.

Mitigation Measure BIO-166: Conduct preconstruction surveys for roosting bats and implement protective measures

See Mitigation Measure BIO-166 under Impact BIO-166.

Impact BIO-168: Periodic effects of inundation of special-status bat habitat as a result of implementation of conservation components

Flooding of the Yolo Bypass from *CM2 Yolo Bypass Fisheries Enhancement* would periodically affect 45–79 acres of roosting habitat and 3,271–7,372 acres of foraging habitat for special-status bats in the study area (Table 12-4-60).

CM5 Seasonally Inundated Floodplain Restoration would periodically inundate up to 229 acres of roosting habitat and 8,027 acres of foraging habitat for special-status bats. Potential roosting trees are likely to be retained within seasonally flooded areas, although high velocity flooding could uproot some trees. Seasonal flooding would not adversely affect foraging habitat for the species. The overall effect of seasonal inundation in existing riparian natural communities may instead be beneficial. Historically, flooding was the main natural disturbance regulating ecological processes in riparian areas, and flooding promotes the germination and establishment of many native riparian plants. In the late long-term, seasonal inundation in areas currently occupied by riparian vegetation may contribute to the establishment of high-value habitat for special-status bats that use riparian habitats.

The periodic losses of roosting and foraging habitat for special-status bats associated with implementing Alternative 4 are not expected to result in substantial adverse effects on special-status bats, either directly or through habitat modifications and would not result in a substantial reduction in numbers or a restriction in the range of special-status bats. Mitigation Measure BIO-166, *Conduct preconstruction surveys for roosting bats and implement protective measures*, is available to address any effects of periodic inundation on special-status bats and roosting habitat. Therefore, Alternative 4 would not adversely affect the species.

CEQA Conclusion: Periodic inundation under CM2 and floodplain restoration under CM5 would periodically affect foraging and roosting habitat for special-status bats in the study area. Any impact of periodic inundation on special-status bats would be mitigated through implementation of Mitigation Measure BIO-166, which would ensure there is no significant impact on roosting special-status bats, either directly or through habitat modifications and no substantial reduction in numbers or a restriction in the range of special-status bats.

Mitigation Measure BIO-166: Conduct preconstruction surveys for roosting bats and implement protective measures

See Mitigation Measure BIO-166 under Impact BIO-166.

Plant Species

Vernal Pool Plants

Six covered plant species and 11 noncovered special-status plant species occur in vernal pools in the Study Area (Tables 12-2, 12-3). The vernal pool habitat model used for the impact analysis was based on vegetation types and associations from various data sets which were used to create maps showing the distribution of vernal pool habitat in the Study Area according to the species' two habitat types, vernal pool complex and degraded vernal pool complex habitat. Vernal pool complex habitat consists of vernal pools and uplands that display characteristic vernal pool and swale visual signatures that have not been significantly impacted by agricultural or development practices. Degraded vernal pool complex habitat consists of habitat that ranges from areas with vernal pool and swale visual signatures that display clear evidence of significant disturbance due to plowing, discing, or leveling to areas with clearly artificial basins such as shallow agricultural ditches, depressions in fallow fields, and areas of compacted soils in pastures. Because wetlands in the degraded vernal pool complex are inundated during the wet season and may have historically been located in or near areas with natural vernal pool complex, they may support individuals or small populations of species that are found in vernal pools and swales. However, they do not possess the full complement of ecosystem and community characteristics of natural vernal pools, swales and their associated uplands and they are generally ephemeral features that are eliminated during the course of normal agricultural practices.

Because each of the vernal pool species addressed in this EIR have specific microhabitat affinities, and because vernal pool habitat within the Study Area is highly heterogeneous with respect to habitat parameters such as soil type and pool depth, the vernal pool habitat model greatly overestimates the extent of habitat in the Study Area occupied by each species. However, the vernal pool habitat model is likely to encompass all or most of the potential area within which special-status vernal pool plant species would occur. Therefore, it is not likely to underestimate the extent of occupied habitat or to underestimate the effects of the BDCP.

The construction and restoration activities covered under Alternative 4 are not expected to have impacts on special-status vernal pool plants. No modeled habitat and no known occurrences of the 17 vernal pool plants are within the proposed footprint for the Alternative 4 water conveyance facilities. No modeled habitat and no known occurrences of the 17 vernal pool plants are within the hypothetical footprint for restoration activities. Table 12-4-61 summarizes the acreage of modeled vernal pool habitat in the Study Area and the number of occurrences of each special-status vernal pool plant in the Study Area.

Table 12-4-61. Summary of Impacts on Vernal Pool Plants under Alternative 4

	Acres in Study Area	Acres Affected	Occurrences in Study Area	Occurrences Affected	Impacts
Habitat					
Vernal pool complex	9,395	1			None
Degraded vernal pool complex	2,493	370			None
Total	11,888	372			
Covered Species					
Alkali milk-vetch			17	0	None
Dwarf downingia			11	0	None
Boggs Lake hedge-hyssop			1	0	None
Legenere			8	0	None
Heckard's peppergrass			2*	0	None
Noncovered Species					
Ferris' milk-vetch			3	0	None
Vernal pool smallscale			2	0	None
Hogwallow starfish			0	0	None
Ferris' goldfields			4	0	None
Contra Costa goldfields			7	0	None
Cotula-leaf navarretia			5	0	None
Baker's navarretia			3	0	None
Colusa grass			1	0	None
Bearded popcorn-flower			4	0	None
Delta woolly marbles			3	0	None
Saline clover			9	0	None
Solano grass			1	0	None
*Two additional occurrences are in alkali seasonal wetlands.					

Impact BIO-169: Adverse effects on habitat and populations of vernal pool plants

Under Alternative 4, BDCP conservation measures would not affect special-status vernal pool plants.

- *CM1 Water Facilities and Operations*: No modeled habitat and no known occurrences of the 17 vernal pool plants are within the proposed footprint for the Alternative 4 water conveyance facilities. Therefore, under Alternative 4, construction and operation of the water conveyance facilities would not affect the five covered vernal pool plant or the 12 noncovered special-status plants.

  The east-west transmission line could have potential adverse effects on four covered vernal pool species. One occurrence each of dwarf downingia, legenere, Heckard's peppergrass, and Boggs Lake hedge-hyssop are within the alignment. Two acres of modeled habitat for dwarf downingia, legenere, and Heckard's peppergrass could be affected, and three acres of modeled habitat for Boggs Lake hedge-hyssop could be affected.

- *CM2 Yolo Bypass Fisheries Enhancement*: One occurrence of a noncovered vernal pool plant, bearded popcornflower, is within the footprint for the lower Putah Creek improvements component of the Yolo Bypass fisheries enhancements. However, the area potentially affected is not included within the area of modeled vernal pool habitat and may no longer contain suitable habitat. No modeled habitat and no other known occurrences of the 17 vernal pool plants are within the hypothetical footprint for construction or operation of the Yolo Bypass fisheries enhancements. Therefore, construction and operation of CM2 may affect bearded popcornflower but would not affect the other covered or noncovered vernal pool plants.
- *CM3 Natural Communities Protection and Restoration*: The BDCP proposes to benefit covered vernal pool plants by protecting 600 acres of vernal pool complex in CZs 1, 8, and 11. The protected vernal pool habitat would be managed and enhanced to sustain populations of native vernal pool species. These benefits also would accrue to any noncovered vernal pool plants occurring in the protected vernal pool complex.
- *CM4 Tidal Natural Communities Restoration*: Tidal habitat restoration would result in the inundation of 372 acres of vernal pool complex and would, therefore, potentially affect special-status vernal pool plants. However, most of this habitat (370 acres) consists of degraded vernal pool habitat that is unlikely to contain special-status plants.
- *CM5 Seasonally Inundated Floodplain Restoration*: No vernal pool habitat or occurrences of special-status vernal pool plants are present within areas proposed for floodplain restoration. Therefore, floodplain restoration and construction of new floodplain levees would have no impacts on covered and noncovered vernal pool plants.
- *CM6 Channel Margin Enhancement*: No vernal pool habitat or occurrences of special-status vernal pool plants are present within areas proposed for channel margin habitat enhancement. Therefore, channel margin habitat enhancement would have no impacts on covered and noncovered vernal pool plants.
- *CM7 Riparian Natural Community Restoration*: No vernal pool habitat or occurrences of special-status vernal pool plants are present within areas proposed for riparian habitat enhancement. Therefore, riparian habitat enhancement would have no impacts on covered and noncovered vernal pool plants.
- *CM8 Grassland Natural Community Restoration*: Although the vernal pool complex habitat includes grassland matrix within which the vernal pools occur, grassland restoration activities would take place in nongrasslands (ruderal habitat, agricultural land) or degraded grasslands that are not included within vernal pool complex habitat. Therefore, grassland communities restoration would have no impacts on covered and noncovered vernal pool plants.
- *CM9 Vernal Pool and Alkali Seasonal Wetland Complex Restoration*: If, through unforeseen circumstances, BDCP activities result in the net loss of vernal pool habitat, CM9 would be implemented to compensate for that loss. Because vernal pool complex restoration would focus on habitat that had been cleared and leveled but maintained an intact duripan or claypan, the likelihood of affecting any special-status vernal pool plants would be low. However, vernal pool restoration potentially could adversely affect remnant populations of special-status vernal pool plants or potentially affect vernal pool habitat adjacent to the restoration areas.

- *CM10 Nontidal Marsh Restoration*: Nontidal marsh restoration would take place through conversion of agricultural lands. Therefore, nontidal marsh restoration would avoid vernal pool habitat and would have no impacts on covered and noncovered vernal pool plants.
- *CM22 Avoidance and Minimization Measures*: Effects on covered vernal pool plants potentially resulting from implementation of CM4 would be avoided or minimized though *AMM11 Covered Plant Species* and *AMM2 Construction Best Management Practices and Monitoring*. AMM11 prohibits ground disturbance or hydrologic disturbance within 250 feet of existing vernal pools. In addition, AMM11 specifies that individual projects be designed to avoid critical habitat for listed plant and wildlife vernal pool species.

In addition, the BDCP includes species-specific goals to benefit covered vernal pool plants. This includes protecting two occurrences each of alkali milkvetch and Heckard's peppergrass. The specific goal for Heckard's peppergrass includes allowing the establishing of new occurrence of Heckard's peppergrass. However, the ability to establish new occurrences of Heckard's peppergrass has not been demonstrated to be feasible. Therefore, because the outcome of an attempt to establish new occurrences of Heckard's peppergrass cannot be predicted, this goal alternative can be considered beneficial because it would generate information on the ecology of the species, but it would not compensate for any adverse effects on the species. Because noncovered species are not protected under the BDCP, one occurrence of bearded popcornflower in the Yolo Bypass could be adversely affected by the Yolo Bypass fisheries enhancements.

The east-west transmission corridor could have potential adverse effects on four covered vernal pool species. Adverse effects on these species would be avoided through implementation of AMM11. In summary, no adverse effects on special-status vernal pool plants would be expected from implementing Alternative 4. No known occurrences of special-status vernal pool plants would be affected under Alternative 4, and impacts on four covered species resulting from the east-west transmission corridor would be avoided through AMMs. Loss of modeled habitat for special-status vernal pool plants would be compensated for by vernal pool complex restoration. At typical NEPA and CEQA project-level mitigation ratios (1:1 for restoration), 372 acres of vernal pool complex restoration would be conducted (375 acres for the east-west transmission corridor). Beneficial effects on special-status vernal pool plants could occur by protecting 600 acres of vernal pool complex in CZs 1, 8, and 11 and by protecting occurrences of alkali milk-vetch and Heckard's peppergrass.

CEQA Conclusion: Implementation of Alternative 4 would not result in a reduction in the range or numbers of 16 covered and noncovered special-status vernal pool plants in the Study Area and would therefore have no significant impacts on those special-status vernal pool plants. Adverse effects on one noncovered species, bearded popcornflower, could result in a reduction in the range or numbers of the species, which would be a significant impact. Mitigation Measure BIO-169 would reduce this impact to a less-than-significant level.

Mitigation Measure BIO-169: Apply *CM22 Avoidance and Minimization Measures* to noncovered special-status plant species

CM22 Avoidance and Minimization Measures, specifically *AMM1 Worker Awareness Training*, *AMM2 Construction Best Management Practices and Monitoring*, *AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan*, and *AMM11 Covered Plant Species*, will be implemented for all noncovered special-status plant species adversely affected by the BDCP to avoid, minimize, or compensate for impacts.

Alkali Seasonal Wetland Plants

Five covered species and three noncovered plants occur in alkali seasonal wetlands in the Study Area (Tables 12-2, 12-3). Alkali seasonal wetland habitat was modeled separately for four covered plant species occurring in seasonal alkali wetlands.

The San Joaquin spearscale habitat model approximated the distribution of suitable San Joaquin spearscale habitat in the Study Area according to the species' preferred habitat types, intersected with soil series and slope position. Historical and current records of San Joaquin spearscale in the Study Area indicate that its current distribution is limited to alkaline soil areas with shallow basin or swale microtopography along the western border. The vegetation cover of the alkaline soils is typically a combination of alkaline soil-adapted species and annual grasses, including annual ryegrass and Mediterranean barley. Habitat types used for the model included alkali seasonal wetlands, vernal pool complex, and grasslands. Soil series used in the model consisted of either clays or clay loams with alkaline horizons. San Joaquin spearscale typically occurs in swales or in level terrain but occasionally occurs on the lower slopes adjacent to streams or swales or where seeps are present. Because some of the soil series with which San Joaquin spearscale is associated can occur on hillsides, slope was used to limit the extent of the model to the toe of the slope where these soils occur by excluding areas with slope greater than 1%. Land uses that are incompatible with the species' habitat requirements, such as modeled habitat polygons falling on leveled or developed lands, were removed from the model.

Modeled habitat for brittlescale was mapped as hydrologic features such as stream corridors and playa pools located on alluvium associated with the Montezuma Block along the western boundary of the Study Area or on alluvium associated with tertiary formations located along the southwest boundary of the Study Area. Stream corridors (intermittent and perennial) that intersected these geologic units were selected and truncated at the point at which they encountered the upper elevation of intertidal marsh. The corridors were buffered 50 feet (15.2 meters) on either side of their centerlines to capture the estimated maximum extent of alluvium deposits in proximity to the streams. Mapped habitat that was occupied by urban or intensive agricultural uses was removed from the model.

The habitat model for heartscale was based on the species distribution in the Study Area (Solano and Yolo Counties) and on the soil types and plant communities within which it occurs. Potential habitat was determined by intersecting the GIS coverage for three parameters: 1) Yolo and Solano County boundaries; 2) Solano, Pescadero, and Willows soils; and 3) grassland, alkali seasonal wetland, and vernal pool complex natural communities. The model excluded areas that have been developed or cultivated, i.e., where the topography, soils, and hydrology have been substantially altered.

Delta button-celery habitat was modeled as alkali seasonal wetland complex, vernal pool complex, other natural seasonal wetland, and grassland occurring on Brentwood, Grangerville, Marcuse, Solano, and Vernalis soil map units within the San Joaquin Basin (i.e., south of the mainstem San Joaquin River). For this species, land cover north of the Discovery Bay area where intensive agriculture was classified as annual grassland were manually deleted from the area of predicted habitat. Additionally, other areas of potential habitat that have been developed were also manually deleted.

Modeled habitat for Delta button-celery would be adversely affected by construction of the Alternative 4 water conveyance facilities. One population of crownscale also would be adversely affected by construction of the water conveyance facilities. Modeled habitat for brittlescale and heartscale could be adversely affected by tidal habitat restoration. One occurrence each of heartscale and Heckard's peppergrass could be affected by tidal habitat restoration. No adverse effects on palmate-bracted bird's-beak or recurved larkspur would be expected. Table 12-4-62 summarizes the acreage of modeled alkali seasonal wetland habitat in the Study Area and the number of occurrences of each special-status alkali seasonal wetland plant in the Study Area.

Table 12-4-62. Summary of Impacts on Seasonal Alkali Wetland Plants under Alternative 4

	Acres in Study Area	Acres Affected	Occurrences in Study Area	Occurrences Affected	Impacts
Habitat					
San Joaquin spearscale modeled habitat	14,479	748			Habitat loss from construction of water conveyance facilities, construction of Yolo Bypass fisheries enhancements, tidal habitat restoration, and floodplain restoration levee construction
Brittlescale modeled habitat	467	4			Habitat loss from tidal habitat restoration
Heartscale modeled habitat	6,451	306			Habitat loss from tidal habitat restoration
Delta button-celery modeled habitat	3,329*	18			Habitat loss from construction of water conveyance facilities
Alkali seasonal wetlands	3,723	72			Habitat loss from tidal restoration and Yolo Bypass Fisheries enhancements
Covered Species					
San Joaquin spearscale			16	0	None
Brittlescale			6	0	None
Heartscale			3	0	None
Delta button-celery			1**	0	None
Heckard's peppergrass			2***	1	Population loss from tidal habitat restoration
Noncovered Species					
Crownscale			17	1	Population loss from construction of water conveyance facilities
Palmate-bracted bird's-beak			1	0	None
Recurved larkspur			4	0	None

* A portion of this acreage consists of riparian habitat.
** A second occurrence in Study Area is in riparian habitat.
*** Two additional occurrences of Heckard's peppergrass are associated with vernal pools.

Impact BIO-170: Adverse effects on habitat and populations of alkali seasonal wetland plants

Under Alternative 4, the BDCP would have adverse effects on modeled habitat for San Joaquin spearscale, brittlescale, heartscale, and Delta button-celery. It would also have adverse effects on occurrences of heartscale, Heckard's peppergrass, and crownscale.

- *CM1 Water Facilities and Operations*: Under Alternative 4, construction of the Byron Tract Forebay would permanently remove 69 acres of modeled habitat for San Joaquin spearscale and 18 acres of modeled habitat for Delta button-celery. This could be an adverse effect, depending on whether or not the affected modeled habitat is actually occupied by the species. Modeled habitat is assumed to encompass all potential habitat for a species and may therefore overestimate the area actually occupied. Known occurrences of San Joaquin spearscale near the forebay do not appear to be affected by facilities construction. Delta button-celery is not known to occur in CZ 8; the nearest known occurrence, in CZ 9, would not be affected.

  Construction of the water conveyance facilities would permanently remove 0.2 acre of habitat occupied by crownscale at the Byron Tract Forebay. Part of the occurrence would be removed, but most of the occurrence would not be directly affected. However, a reduction of the population size, both in area and number of individuals present, would be an adverse impact.

  Construction of the water conveyance facilities would not affect brittlescale, heartscale, Heckard's peppergrass, palmate-bracted bird's-beak, or recurved larkspur.

- *CM2 Yolo Bypass Fisheries Enhancement*: Construction of the Yolo Bypass improvements would permanently remove 56 acres of modeled habitat for San Joaquin spearscale. No known occurrences of San Joaquin spearscale would be affected. No modeled habitat and no known occurrences of the seven other alkali seasonal wetland plants are within the hypothetical footprint for construction or operation of the Yolo Bypass fisheries enhancements.

- *CM3 Natural Communities Protection and Restoration*: Alternative 4 would benefit alkali seasonal wetland plants by protecting 150 acres of alkali seasonal wetland in Conservation Zones 1, 8, and/or 11. The protected alkali seasonal wetland habitat would be managed and enhanced to sustain populations of native plant species.

- *CM4 Tidal Natural Communities Restoration*: Tidal habitat restoration is expected to convert alkali seasonal wetlands on the margins of tidal wetlands to freshwater or brackish tidal marsh. Tidal habitat restoration would convert 622 acres of modeled habitat for San Joaquin spearscale to tidal marsh. Tidal habitat restoration would permanently remove 4 acres of modeled habitat for brittlescale in CZ 1 near Lindsey Slough and in CZ 11 near Nurse Slough. Tidal habitat restoration would remove 306 acres of modeled habitat for heartscale in CZ 1 in the vicinity of Jepson Prairie and in CZ 11 adjacent to Suisun Marsh. The extent to which the modeled habitat is actually occupied by these species is not known; modeled habitat is assumed to encompass all potential habitat for a species and may therefore overestimate the area actually occupied. Tidal habitat restoration could adversely affect an occurrence of Heckard's peppergrass at Hass Slough, in CZ 1. This occurrence is based on a historic record, and the whether or not the population still exists is not known. In each case, the loss of modeled habitat and occurrences for covered species are potentially adverse effects. Delta button celery, crownscale, palmate-bracted bird's-beak, and recurved larkspur would not be affected by tidal habitat restoration.

- *CM5 Seasonally Inundated Floodplain Restoration*: Floodplain restoration levee construction would result in the removal of 2 acres of modeled habitat for San Joaquin spearscale. No known occurrences of San Joaquin spearscale would be affected. No other alkali seasonal wetland habitat or occurrences of special-status alkali seasonal wetland plants are present within areas proposed for floodplain restoration. Therefore, floodplain restoration and construction of new floodplain levees would have no impacts on covered and noncovered alkali seasonal wetland plants.

- *CM6 Channel Margin Enhancement*: No alkali seasonal wetland habitat or occurrences of special-status alkali seasonal wetland plants are present within areas proposed for channel margin habitat enhancement. Therefore, channel margin habitat enhancement would have no impacts on covered and noncovered alkali seasonal wetland plants.
- *CM7 Riparian Natural Communities Restoration*: No alkali seasonal wetland habitat or occurrences of special-status alkali seasonal wetland plants are present within areas proposed for riparian habitat enhancement. Therefore, riparian habitat enhancement would have no impacts on covered and noncovered alkali seasonal wetland plants.
- *CM8 Grassland Natural Communities Restoration*: Although the alkali seasonal wetland habitat includes the grassland matrix within which the wetlands occur, grassland restoration activities would take place in non-grasslands (ruderal habitat, agricultural land) or degraded grasslands that are not included within alkali seasonal wetland habitat. Therefore, grassland communities restoration would have no impacts on covered and noncovered alkali seasonal wetland plants.
- *CM9 Vernal Pool and Alkali Seasonal Wetland Complex Restoration*: Although some vernal pools are alkaline, alkali seasonal wetlands in the Study Area consist of alkali grassland, alkali meadow, or iodine bush scrub. Therefore, vernal pool restoration would avoid alkali seasonal wetland habitat and would have no impacts on covered and noncovered alkali seasonal wetland plants. In addition, the BDCP would compensate for the loss of alkali seasonal wetlands resulting from other conservation measures by restoring or creating 72 acres of alkali seasonal wetlands in Conservation Zones 1, 8, or 11 to achieve no net loss of this habitat.
- *CM10 Nontidal Marsh Restoration*: Nontidal marsh restoration would take place through conversion of agricultural lands. Therefore, nontidal marsh restoration would avoid alkali seasonal wetland habitat and would have no impacts on covered and noncovered alkali seasonal wetland plants.
- *CM22 Avoidance and Minimization Measures*: Effects on special-status alkali seasonal wetland plants potentially resulting from implementation of CM1 and CM4 would be avoided or minimized though *AMM11 Covered Plant Species* and *AMM2 Construction Best Management Practices and Monitoring*. Under AMM11, surveys for covered plant species would be performed during the planning phase of projects, and any impacts on populations of covered species would be avoided through project design or subsequently minimized though AMM25. In addition, AMM11 prohibits ground disturbance or hydrologic disturbance within 250 feet of existing vernal pools, which would protect those species with modeled habitat that includes vernal pool complex. Occurrences of covered species in vernal pools near tidal wetlands would not be affected by tidal habitat restoration where critical habitat for vernal pool species is present and would be avoided under AMM11.

The primary effect of the BDCP on special-status alkali seasonal wetland plants would be the loss of potential (i.e., modeled) habitat for San Joaquin spearscale, brittlescale, heartscale, and Delta button-celery. Approximately 72 acres of this habitat loss would be alkali seasonal wetlands. No known occurrences of special-status alkali seasonal wetland species would be affected, although one historic occurrence of Heckard's peppergrass could be affected by tidal restoration activities, if that occurrence still exists. Loss of modeled habitat would be compensated for by restoring or creating vernal pool complex, alkali seasonal wetlands, and grasslands, in proportion to the amount of each habitat removed. Restoring or creating habitat to replace the habitat lost as a result of the BDCP would reduce this effect to a level that is no longer adverse.

The BDCP would have a small beneficial effect on special-status alkali seasonal wetland plants by protecting 150 acres of alkali seasonal wetland habitat. The BDCP also includes the species-specific goal that the protected 150 acres would be modeled habitat for brittlescale and heartscale and another goal that would protect 2 occurrences of Heckard's peppergrass. The benefits of habitat protection and management also would accrue to any noncovered alkali seasonal wetland plants occurring in the protected habitat.

CEQA Conclusion: Under Alternative 4, impacts on alkali seasonal wetlands as a result of implementing the BDCP would not result in substantially reducing the number or restricting the range of five covered and two noncovered plant species. However, conservation measures that benefit or protect covered species do not apply to noncovered species, and portions of the crownscale population at Byron Tract Forebay would be lost, which would be would be a significant impact. Mitigation Measure BIO-169 would reduce this impact to less than significant.

Mitigation Measure BIO-169: Apply *CM22 Avoidance and Minimization Measures* to noncovered special-status plant species

Please see Mitigation Measure BIO-169 under Impact BIO-169.

Grassland Plants

One covered plant and 11 noncovered special-status plants occur in grasslands in the Study Area (Tables 12-2, 12-3). The only covered plant species occurring in grassland is Carquinez goldenbush. Carquinez goldenbush modeled habitat included hydrological features such as stream corridors on alluvium derived from the Montezuma Formation. Stream corridors (intermittent and perennial) that intersected these geologic units were selected and truncated at the point at which they encountered the upper elevation of intertidal marsh. The corridors were buffered 50 feet (15 meters) on either side in an effort to capture the estimated maximum extend of alluvium deposits in close proximity to the actual rivers/streams.

Of 80,335 acres of grasslands in the Study Area, the BDCP would adversely affect 1,010 acres under Alternative 4, including 4 acres that are modeled habitat for Carquinez goldenbush. For 10 of the plants, no known occurrences would be affected. One of five Parry's rough tarplant occurrences in the Study Area could be adversely affected by the BDCP. Table 12-4-63 summarizes the acreage of grassland habitat in the Study Area and the number of occurrences of each special-status grassland plant in the Study Area.

Table 12-4-63. Summary of Impacts on Grassland Plants under Alternative 4

	Acres in Study Area	Acres Affected	Occurrences in Study Area	Occurrences Affected	Impacts
Habitat					
Carquinez goldenbush modeled habitat	1,019	4			Habitat loss from tidal habitat restoration

Grassland	80,335	5,325			Habitat loss from construction of water conveyance facilities, tidal restoration, Yolo Bypass Fisheries enhancements, floodplain restoration, and construction of conservation hatcheries facilities
Covered Species					
Carquinez goldenbush			8	0	None
Noncovered Species					
Big tarplant			5	0	None
Round-leaved filaree			2	0	None
Pappose tarplant			7	0	None
Parry's rough tarplant			5	1	Periodic inundation of one occurrence as a result of Yolo Bypass operations
Small-flowered morning-glory			0	0	None
Diamond-petaled poppy			1	0	None
Stinkbells			1	0	None
Fragrant fritillary			4	0	None
Gairdner's yampah			0	0	None
Streamside daisy*			1	0	None
Caper-fruited tropidocarpum			8	0	None

* This species actually occurs in upland woodland, a habitat that has not been mapped or quantified in the BDCP.

Impact BIO-171: Adverse effects on habitat and populations of grassland species

Under Alternative 4, the BDCP would have adverse effects on modeled habitat for Carquinez goldenbush. It would also have adverse effects on one occurrence of Parry's rough tarplant. Although the BDCP would have no expected effects on known occurrences of the other special-status plant species that occur in grasslands, the loss of 5,325 acres of grassland would have the potential to adversely affect undocumented populations of special-status grassland species.

- *CM1 Water Facilities and Operations*: No modeled habitat for Carquinez goldenbush and no known occurrences of the 12 special-status grassland plants are within the proposed footprint for the Alternative 4 water conveyance facilities. About 580 acres of grassland habitat would be affected by construction of the water conveyance facilities. However, this grassland habitat consists of small patches of herbaceous ruderal vegetation along levees that do not provide habitat for special-status grassland species. Therefore, under Alternative 4, construction and operation of the water conveyance facilities would not affect the 12 special-status grassland plants.
- *CM2 Yolo Bypass Fisheries Enhancement*: Construction of the Yolo Bypass fisheries enhancements would remove 426 acres of grassland habitat. Yolo Bypass operations would result in more

frequent and longer inundation of 1,597 acres of grasslands in the Yolo Bypass (CZ 2) that include habitat for one occurrence of Parry's rough tarplant. Parry's rough tarplant is a summer-blooming plant that occurs in areas subject to occasional inundation during the wet season, such as swales and seasonal wetlands. Increasing the frequency or duration of inundation may decrease the distribution in some areas by making some conditions too wet but would also expand the distribution into areas that may currently be too dry. Overall, changing the frequency and duration of inundation in the area of this occurrence should not result in a substantial change in the range of numbers of Parry's rough tarplant. Construction and operation of the Yolo Bypass Fisheries enhancements would not affect modeled habitat for Carquinez goldenbush or known occurrences of other special-status grassland plants.

- *CM3 Natural Communities Protection and Restoration*: Alternative 4 would preserve 8,000 acres of grassland habitat, some of which may contain modeled habitat for Carquinez goldenbush. Protection of grassland habitat may also protect undiscovered occurrences of special-status plant species.
- *CM4 Tidal Natural Communities Restoration*: Tidal habitat restoration would permanently remove 1,506 acres of grassland habitat, including 4 acres of modeled habitat for Carquinez goldenbush along the eastern side of Suisun Marsh. No known occurrences of special-status grassland plants are within the hypothetical footprint of tidal restoration. Therefore, tidal restoration would have no impacts on known occurrences of special-status grassland plants.
- *CM5 Seasonally Inundated Floodplain Restoration*: Construction of new floodplain levees would result in the loss of 82 acres of grassland habitat, periodic inundation of the floodplain would affect 513 acres of grassland habitat, and another 399 acres of grassland habitat would be converted to riparian habitat. However, no modeled habitat for Carquinez goldenbush or known occurrences of special-status grassland plants are present within areas proposed for floodplain restoration, and the affected grassland habitat consists of herbaceous ruderal vegetation that does not support special-status grassland plants. Therefore, floodplain restoration and construction of new floodplain levees would have no impacts on covered and noncovered grassland plants.
- *CM6 Channel Margin Enhancement*: No known occurrences of special-status grassland plants are present within areas proposed for channel margin habitat enhancement. Areas mapped as grassland along levees that would be affected by channel margin habitat enhancement are small patches of ruderal vegetation along levees that do not provide habitat for special-status grassland species and are not modeled habitat for Carquinez goldenbush. Therefore, channel margin habitat enhancement would have no impacts on covered and noncovered grassland plants.
- *CM7 Riparian Natural Community Restoration*: No modeled habitat for Carquinez goldenbush or known occurrences of special-status grassland plants are present within areas proposed for riparian habitat enhancement. Therefore, riparian habitat enhancement would have no impacts on covered and noncovered grassland plants.
- *CM8 Grassland Natural Community Restoration*: Grassland restoration would restore 2,000 acres of grassland habitat. Restoration activities would take place in non-grasslands (ruderal habitat, agricultural land) or degraded grasslands. These areas do not currently provide habitat for special-status grassland plants. Therefore, grassland communities restoration would have no impacts on covered and noncovered grassland plants.

- *CM9 Vernal Pool and Alkali Seasonal Wetland Complex Restoration*: Vernal pool complex includes vernal pools as well as the surrounding grassland matrix. Because the habitat to be restored would consist of areas of former vernal pool complex that have been leveled for cultivation, special-status grassland plants would not be present. Therefore, vernal pool complex restoration would not affect special-status grassland plants.
- *CM10 Nontidal Marsh Restoration*: Nontidal marsh restoration would take place through conversion of agricultural lands. Therefore, nontidal marsh restoration would avoid grassland habitat and would have no impacts on covered and noncovered grassland plants.
- *CM18 Conservation Hatcheries*: Construction of the conservation hatcheries would remove 35 acres of grassland habitat. The removed habitat would consist of ruderal herbaceous vegetation that would not be likely to provide habitat for special-status grassland plants. Therefore, construction of the conservation hatcheries would not be expected to affect special-status grassland plants.
- *CM22 Avoidance and Minimization Measures*: Effects on Carquinez goldenbush potentially resulting from implementation of CM4 and potential effects on undiscovered populations of special-status grassland plants would be avoided or minimized though *AMM11 Covered Plant Species* and *AMM2 Construction Best Management Practices and Monitoring*. Under AMM11, surveys for covered plant species would be performed during the planning phase of projects, and any impacts on populations of covered species would be avoided through project design or subsequently minimized though AMM2.

The primary effect of the BDCP on special-status grassland plants is the loss of potential (i.e., modeled) habitat for Carquinez goldenbush. One occurrence of Parry's rough tarplant would be affected by CM2, but the effect is not expected to be adverse. No known occurrences of the other special-status grassland plants would be affected.

The BDCP would have a potential beneficial effect on special-status grassland plants by protecting 8,000 acres of grassland habitat. To ensure that this habitat preservation would specifically benefit Carquinez goldenbush, the plan proposes to protect at least three Carquinez goldenbush occurrences in CZs 1 and 11 that are currently not protected. The preservation of modeled or potential habitat, together with avoidance and minimization of impacts on species occurrences, would reduce any effects of BDCP implementation on covered grassland plants to a level that is no longer adverse.

CEQA Conclusion: Under Alternative 4, the BDCP would not result in substantially reducing the numbers or restricting the range of one covered or 11 noncovered special-status grassland plants, and this impact would be less than significant. No mitigation is required.

Valley/Foothill Riparian Plants

Two covered plants and two noncovered special-status plants occur in valley/foothill riparian habitat in the Study Area (Tables 12-2, 12-3). The valley/foothill riparian habitat model for Delta button-celery and slough thistle was mapped as all of the Study Area along the flood plain of the San Joaquin River between the levees from the Mossdale Bridge to Vernalis. Whether or not this modeled habitat is actually occupied by Delta button-celery and slough thistle is unknown; all known occurrences of these species within the area of modeled habitat are believed to be extirpated.

Of 18,449 acres of valley/foothill riparian habitat in the Study Area, Alternative 4 would adversely affect 1,094 acres, including 15 acres that are modeled habitat for Delta button-celery and 11 acres that are modeled habitat for slough thistle. Table 12-4-64 summarizes the acreage of modeled habitat for Delta button-celery and slough thistle and the number of occurrences of each special-status riparian plant in the Study Area.

Table 12-4-64. Summary of Impacts on Valley/Foothill Riparian Plants under Alternative 4

	Acres in Study Area	Acres Affected	Occurrences in Study Area	Occurrences Affected	Impacts
Habitat					
Delta button-celery modeled habitat	3,329*	15			Habitat loss from floodplain restoration
Slough thistle modeled habitat	1,834	11			Habitat loss from floodplain restoration
Valley/foothill riparian habitat	18,449	1,359			Habitat loss from construction of water conveyance facilities, tidal restoration, Yolo Bypass fisheries enhancements, and floodplain restoration
Covered Species					
Delta button-celery			1**	1	Occurrence potentially affected by floodplain restoration
Slough thistle			2	2	Occurrences potentially affected by floodplain restoration
Noncovered Species					
Northern California black walnut			1	0	None
Wright's trichocoronis			1	0	None
*A portion of this acreage consists of alkali seasonal wetland **A second occurrence is in alkali seasonal wetland					

Impact BIO-172: Adverse effects on habitat and populations of valley/foothill riparian plants

No extant occurrences of Delta button-celery, slough thistle, Northern California black walnut, or Wright's trichocoronis are present in the Study Area. Therefore, no impacts on special-status valley/foothill riparian plants are expected. Modeled habitat for Delta button-celery and slough thistle, which may support undocumented occurrences of these species, would be affected by restoration of seasonally inundated floodplain.

- *CM1 Water Facilities and Operations*: Construction of the water conveyance facilities would remove 43 acres of valley-foothill riparian habitat under Alternative 4. However, no modeled habitat and no known occurrences of the four special-status valley/foothill riparian plants are within the proposed footprint for the Alternative 4 water conveyance facilities. Therefore, under

Alternative 4, construction and operation of the water conveyance facilities would not affect covered or noncovered special-status valley/foothill riparian plants.

- *CM2 Yolo Bypass Fisheries Enhancement*: Construction and operation of the Yolo Bypass fisheries enhancements would adversely affect 378 acres of valley/foothill riparian habitat. However, no modeled habitat and no known occurrences of the four special-status valley/foothill riparian plants are within the hypothetical footprint for construction or operation of the Yolo Bypass fisheries enhancements. Therefore, construction and operation of the Yolo Bypass Fisheries enhancements would not affect the covered or noncovered valley/foothill riparian plants.
- *CM3 Natural Communities Protection and Restoration*: Alternative 4 would protect 552 acres of existing valley/foothill riparian forest in CZ 7. This action would have no substantial effects on special-status valley/foothill plants because no extant occurrences of special-status valley/foothill plants are present in the Study Area.
- *CM4 Tidal Natural Communities Restoration*: Tidal habitat restoration would inundate 552 acres of valley/foothill riparian habitat. However, no modeled habitat and no known occurrences of the four special-status valley/foothill riparian plants are within the hypothetical footprint for tidal restoration. Therefore, tidal restoration would not affect the covered or noncovered valley/foothill riparian plants.
- *CM5 Seasonally Inundated Floodplain Restoration*: Floodplain restoration levee construction would remove 78 acres of valley/foothill riparian habitat, including 15 acres of modeled habitat for Delta button-celery along the San Joaquin River in CZ 7. In addition, floodplain restoration would result in more frequent and longer inundation of 18 acres of modeled habitat for Delta button-celery in this area. The area affected contains one historic occurrence of Delta button celery. This occurrence is considered to be extirpated, because all habitat for Delta button-celery at his location has been converted to agriculture (California Department of Fish and Game 2012kkkk). Therefore, the BDCP would not have an adverse effect on Delta button celery in CZ 7.

  The BDCP proposes to benefit Delta button-celery at this location by restoring 5,000 acres of valley/foothill riparian habitat and re-introducing two occurrences of Delta button-celery. Although Delta button celery occurs in riparian habitat, it is not associated with woodland or scrub habitats; rather, it occurs in alkali seasonal wetlands in floodplains, which may or may not also contain adjacent woody riparian habitat. Restoring habitat for Delta button-celery may not be compatible with restoring woody riparian habitat. In addition, establishing new populations of Delta button-celery is an untried, unproven procedure and may not be feasible. Therefore, any beneficial effects on Delta button-celery would be speculative.

  Floodplain restoration levee construction would remove 11 acres of modeled habitat for slough thistle and would result in more frequent and longer inundation of 6 acres of modeled habitat for slough thistle along the San Joaquin River in CZ 7. Whether the affected modeled habitat is actually occupied by slough thistle is not known; however, of two historic occurrences of slough thistle present in the Study Area, only one is considered to be extirpated (California Department of Fish and Game 2012wwww). The BDCP would protect and enhance two occurrences of slough thistle. If occurrences are not found in the Study Area, then two, self-sustaining occurrences of slough thistle would be established using locally-sourced genetic material for a total of two occurrences within the restored floodplain habitat on the main stem of the San Joaquin River in Conservation Zone 7 between Mossdale and Vernalis. Establishing new populations of slough thistle is an untried, unproven procedure and may not be feasible. Therefore, any beneficial effects on slough thistle would be speculative.

One historic occurrence of Wright's trichocoronis in the Study Area near Lathrop (CZ 7) could also be affected by floodplain restoration. The occurrence is presumed to be extant because the presence or absence of suitable habitat has not been verified by field surveys (California Department of Fish and Game 2012yyyy). However, the species has not been observed at this location for nearly a century, and habitat for Wright's trichocoronis, which would have been similar to that for Delta button celery and slough thistle, no longer appears to be present in aerial photographs of the area. Therefore, the BDCP would not be expected to have an adverse effect on Wright's trichocoronis.

- *CM6 Channel Margin Habitat Enhancement*: No modeled habitat or occurrences of special-status valley/foothill riparian plants are present within areas proposed for channel margin habitat enhancement. Therefore, channel margin habitat enhancement would have no impacts on covered and noncovered valley/foothill riparian plants.
- *CM7 Riparian Natural Community Restoration*: No extant occurrences of special-status valley/foothill riparian plants are present within areas proposed for riparian habitat restoration. Therefore, riparian habitat restoration would have no impacts on covered and noncovered valley/foothill riparian plants.
- *CM8 Grassland Natural Community Restoration*: No occurrences of special-status valley/foothill riparian plants are present within areas proposed for grassland communities restoration. Therefore, grassland communities restoration would have no impacts on covered and noncovered valley/foothill riparian plants.
- *CM9 Vernal Pool and Alkali Seasonal Wetland Complex Restoration*: No occurrences of special-status valley/foothill riparian plants are present within areas proposed for vernal pool complex restoration. Therefore, vernal pool complex restoration would have no impacts on covered and noncovered valley/foothill riparian plants.
- *CM10 Nontidal Marsh Restoration*: Nontidal marsh restoration would take place through conversion of agricultural lands. Therefore, nontidal marsh restoration would avoid valley/foothill riparian habitat and would have no impacts on covered and noncovered valley/foothill riparian plants.
- *CM22 Avoidance and Minimization Measures*: Effects on Delta button-celery and slough thistle potentially resulting from implementation of CM5 would be avoided or minimized though *AMM11 Covered Plant Species* and *AMM2 Construction Best Management Practices and Monitoring*. Under AMM11, surveys for covered plant species would be performed during the planning phase of projects, and any impacts on populations of covered species would be avoided through project design or subsequently minimized though AMM2.

Because no extant occurrences of special-status valley/foothill riparian plants are known to occur in the Study Area, the BDCP is not expected to adversely affect any special-status valley/foothill riparian plants. Modeled habitat for both Delta button-celery and slough thistle would be affected. Under AMM1 and AMM6, surveys for covered plants would be performed during the planning phase for floodplain restoration. If Delta button-celery or slough thistle were found to be present in the floodplain restoration area, then the project would be designed to avoid impacts on the populations. Therefore, the BDCP would not have an adverse effect on these species.

The BDCP proposes to benefit Delta button-celery and slough thistle by restoring 5,000 acres of valley/foothill riparian habitat and re-introducing two occurrences of both species. Establishing new populations of Delta-button-celery or slough thistle would be a beneficial effect. However, establishing new populations is an untried, unproven procedure and may not be feasible.

CEQA Conclusion: Under Alternative 4, the BDCP would not result in a reduction in the range and numbers of covered and noncovered valley/foothill riparian plants. This impact would be less than significant. No mitigation is required.

Tidal Wetland Plants

Seven covered plants and one noncovered special-status plant occur in tidal wetlands in the Study Area (Tables 12-2, 12-3). Five tidal wetland habitat models were developed for the seven covered plant species occurring in tidal wetland habitat.

Modeled habitat for Mason's lilaeopsis and Delta mudwort was mapped as areas within 10 feet (3 meters) on either side of the landward boundary of tidal perennial aquatic land cover type, which was obtained from the Bay Delta Conservation Plan (BDCP) geographic information system (GIS) vegetation data layer.

The side-flowering skullcap model mapped the distribution of suitable habitat in the Study Area according to the species' habitat association with woody riparian habitat. The model selected Delta riparian vegetation types providing the habitat characteristics that side-flowering skullcap seems to require, namely, woody substrate in freshwater tidal areas. The model included vegetation subunits of the BDCP Valley Riparian natural community characterized by California dogwood, white alder, and arroyo willow.

The modeled habitat for soft bird's-beak consisted of pickleweed- and saltgrass-dominated vegetation units located west of the Antioch Bridge. Modeled habitat for these two plant species was mapped as areas within 10 feet (3 meters) on either side of the landward boundary of tidal perennial aquatic land cover types. The model used all Tidal Brackish Emergent Wetland polygons that were limited by specific vegetation units that are known to be closely associated with soft bird's-beak habitat.

Habitat for Delta tule pea and Suisun Marsh aster was modeled separately based on the salinity of the water. For the tidal freshwater emergent wetland BDCP land cover type, modeled habitat was mapped as the area within 10 feet (3 meters) of the landward side of the landward boundary, exclusively where this land cover type is adjacent to grassland, vernal pool complex, valley/foothill riparian, or agricultural habitats cover types. For brackish water areas in and near Suisun Marsh, the model used all tidal brackish emergent wetland polygons within an elevation range of 7 to 10 feet (2 to 3 meters) to capture elevations 1 foot (30 centimeters) below intertidal to 2 feet (60 centimeters) above intertidal.

The modeled habitat for Suisun thistle in and near Suisun Marsh consists of all tidal brackish emergent wetland polygons with the appropriate vegetation. This included vegetation units dominated by saltscale, saltgrass, pickleweed, and broad-leaved peppergrass.

Of 17,454 acres of tidal wetlands in the Study Area, Alternative 4 would affect 22 acres, including areas that are modeled habitat for Mason's lilaeopsis, Delta mudwort, side-flowering skullcap, Delta tule pea, Suisun Marsh aster, soft bird's-beak, and Suisun thistle. Known occurrences of all of these species would be affected. In addition, four occurrences of Bolander's water-hemlock, a noncovered special-status plant, could be affected by tidal habitat restoration. Table 12-4-65 summarizes the acreage of modeled habitat for covered tidal wetland species and the number of occurrences of each special-status tidal wetland plants in the Study Area.

Table 12-4-65. Summary of Impacts on Tidal Wetland Plants under Alternative 4

	Acres in Study Area	Acres Affected	Occurrences in Study Area	Occurrences Affected	Impacts
Habitat					
Delta mudwort/ Mason's lilaeopsis modeled habitat	6,106	49			Habitat loss from construction of water conveyance facilities, tidal habitat restoration, Yolo Bypass fisheries enhancements, and floodplain restoration
Side-flowering skullcap modeled habitat	2,495	10			Habitat loss from construction of water conveyance facilities, tidal habitat restoration, and floodplain restoration
Soft bird's-beak modeled habitat	1,228	73			Habitat loss from tidal habitat restoration
Delta tule pea/Suisun Marsh aster modeled habitat	5,866	4			Habitat loss from construction of water conveyance facilities, tidal habitat restoration, Yolo Bypass fisheries enhancements, and floodplain restoration
Suisun thistle modeled habitat	1,281	73			Habitat loss from tidal habitat restoration
Tidal brackish emergent wetland	8,501	0			Habitat loss from tidal habitat restoration
Tidal freshwater emergent wetland	8,953	22			Habitat loss from construction of water conveyance facilities, tidal habitat restoration, Yolo Bypass fisheries enhancements, and floodplain restoration
Covered Species					
Delta mudwort			30	3	Occurrences affected by tidal habitat restoration
Delta tule pea			112	26	Occurrences affected by tidal habitat restoration
Mason's lilaeopsis			176	22	Occurrences affected by construction of water conveyance facilities and tidal habitat restoration
Side-flowering skullcap			12	1	Occurrences affected by construction of water conveyance facilities
Soft bird's-beak			12	5	Occurrences affected by tidal habitat restoration
Suisun Marsh aster			101	24	Occurrences affected by construction of water conveyance facilities and tidal habitat restoration
Suisun thistle			4	0	None
Noncovered Species					
Bolander's water hemlock			8	3	Occurrences affected by tidal habitat restoration

Impact BIO-173: Adverse effects on habitat and populations of tidal wetland plants

Under Alternative 4, the BDCP would have adverse effects on tidal marsh special-status plants through implementation of CM1, CM2, CM4, and CM5. No adverse effects are expected from implementation of CM3, or CM6–CM9.

- *CM1 Water Facilities and Operations*: Construction of the Alternative 4 water conveyance facilities would remove 34 acres of modeled habitat for delta mudwort and Mason's lilaeopsis, 4 acres of modeled habitat for side-flowering skullcap, and 2 acres of modeled habitat for Delta tule pea and Suisun Marsh aster. The extent to which modeled habitat is actually occupied by these species is not known; however, 8 occurrences of Mason's lilaeopsis, one occurrence of Suisun Marsh aster, and one occurrence of side-flowering skullcap in the Study Area could be affected by construction impacts. No known occurrences of the other covered and noncovered tidal wetland species would be affected by construction of the water conveyance facilities.
- *CM2 Yolo Bypass Fisheries Enhancement*: Construction of the Yolo Bypass fisheries enhancements would remove 5 acres of modeled habitat for Mason's lilaeopsis and delta mudwort. The extent to which modeled habitat is actually occupied by these species is not known; however, no known occurrences in the Study Area would be affected. Yolo Bypass operations would result in more frequent and longer inundation of 8 acres of modeled habitat Delta tule peas and Suisun Marsh aster. One occurrence of Suisun Marsh aster would be affected by Yolo Bypass operations. Habitat for these species is normally periodically inundated or saturated; therefore, a small increase in the frequency and duration of periodic inundation of the habitat would not be expected to have a substantial effect.
- *CM3 Natural Communities Protection and Restoration*: The BDCP proposes restoring or creating 20 linear miles of transitional tidal areas within other natural communities that would be created or restored, including 3,000 acres of tidal brackish emergent wetland and 13,900 acres of tidal freshwater emergent wetland. In addition, the habitat and ecosystem functions of these areas would be maintained and enhanced. The BDCP does not specifically propose to protect any occurrences of tidal wetland plants nor does it propose active restoration of affected habitat or occurrences. Instead, the BDCP assumes that the 20 linear miles of restored transitional tidal areas will be passively colonized by the covered tidal wetland plants.
- *CM4 Tidal Natural Communities Restoration*: Tidal habitat restoration would permanently remove 6 acres of modeled habitat for Mason's lilaeopsis and Delta mudwort. Habitat loss would occur through conversion of the species habitat (at and immediately above the tidal zone in marshes and along rivers and streams) to inundated tidal habitat. The extent to which modeled habitat is actually occupied by the species is not known; however, 14 of 176 known occurrences of Mason's lilaeopsis and 3 of 57 known occurrences of delta mudwort in the Study Area could be affected by tidal habitat restoration.

  Tidal habitat restoration would remove 4 acres of modeled habitat for side-flowering skullcap. Whether the affected modeled habitat is actually occupied by side-flowering skullcap is not known; however, none of the 12 known occurrences in the Study Area would be affected.

  Tidal habitat restoration would remove 2 acres of modeled habitat for Delta tule pea and Suisun Marsh aster. Habitat loss would result from conversion of the species habitat (at and immediately above the tidal zone in marshes and along rivers and streams) to inundated tidal habitat. The extent to which modeled habitat is actually occupied by the species is not known; however, 26 of 112 known occurrences of Delta tule pea and 23 of 145 occurrences of Suisun Marsh aster in the Study Area would be affected.

Tidal habitat restoration could affect 73 acres of modeled habitat for soft bird's-beak and Suisun thistle. The extent to which modeled habitat is actually occupied by the species is not known; however, five of 12 known occurrences of soft bird's-beak in the Study Area could be affected. None of the four known occurrences of Suisun thistle in the Study Area would be affected.

Tidal habitat restoration could affect three of eight known occurrences of Bolander's water-hemlock, a noncovered special-status species in the Study Area. Because Bolander's water-hemlock occurs in tidal marsh, it may benefit from tidal marsh restoration. However, site preparation, earthwork, and other site activities could adversely affect Bolander's water-hemlock through direct habitat removal.

- *CM5 Seasonally Inundated Floodplain Restoration*: Floodplain restoration levee construction would remove 3 acres of modeled habitat for Mason's lilaeopsis and delta mudwort and 2 acres of modeled habitat for side-flowering skullcap. No known occurrences of these species in the Study Area would be affected by floodplain restoration.

  Floodplain restoration would result in more frequent and longer inundation of 2 acres of modeled habitat for Mason's lilaeopsis and delta mudwort, 18 acres of modeled habitat for side-flowering skullcap, and 1 acre of modeled habitat for Delta tule peas and Suisun Marsh aster. No known occurrences of these species in the Study Area would be affected by periodic inundation of restored floodplain habitat. Habitat for these species is normally periodically inundated or saturated; therefore, a small increase in the frequency and duration of periodic inundation of the habitat would not be expected to have a substantial effect.

- *CM6 Channel Margin Enhancement*: Effects of channel margin enhancement were not analyzed separately from the effects of tidal habitat restoration. Channel margin enhancement would have adverse effects on tidal wetland plants through direct removal and habitat modification. However, it would have beneficial effects on these species by improving the habitat functions for these species as a result of riprap removal and creation of floodplain benches. Side-flowering skullcap would benefit from installation of large woody material, which it appears to colonize.

- *CM7 Riparian Natural Community Restoration*: Riparian habitat restoration is not expected to adversely affect special-status tidal wetland plants. Preparatory work that involves habitat disturbance would occur during implementation of CM4 and CM5. Riparian plantings carried out for CM7 would be placed in floodplain areas, not in tidal wetlands.

- *CM8 Grassland Natural Community Restoration*: No tidal wetlands or occurrences of special-status tidal wetland plants are present within areas proposed for grassland communities restoration. Therefore, grassland communities restoration would have no impacts on covered and noncovered tidal wetland plants.

- *CM9 Vernal Pool and Alkali Seasonal Wetland Complex Restoration*: No tidal wetlands or occurrences of special-status tidal wetland plants are present within areas proposed for vernal pool complex restoration. Therefore, vernal pool complex restoration would have no impacts on covered and noncovered tidal wetland plants.

- *CM10 Nontidal Marsh Restoration*: Nontidal marsh restoration would take place through conversion of agricultural lands. Therefore, nontidal marsh restoration would avoid tidal wetland habitat and would have no impacts on covered and noncovered tidal wetland plants.

- *CM22 Avoidance and Minimization Measures*: Effects on covered tidal wetland plants potentially resulting from implementation of CM1, CM2, CM4, and CM5 would be avoided or minimized though *AMM11 Covered Plant Species* and *AMM2 Construction Best Management Practices and Monitoring*. Under AMM11, surveys for covered plant species would be performed during the planning phase of projects, and any impacts on populations of covered species would be avoided through project design or subsequently minimized though AMM2. In addition, AMM11 contains specific guidance to avoid adverse modification of any of the primary constituent elements for Suisun thistle or soft bird's-beak critical habitat.

Alternative 4 would result in the loss of modeled habitat for all of the covered species and potentially adverse effects on known occurrences of all of the special-status plants occurring in tidal wetlands. However, restoring or creating 20 linear miles of transitional tidal areas, 3,000 acres of tidal brackish emergent wetland, and 13,900 acres of tidal freshwater emergent wetland would greatly expand the amount of habitat available to each of these species. Although active restoration of these species is not proposed, the natural expansion of populations into the restored habitat is expected to result in no net loss of occurrences for all covered tidal wetlands plants. Post-implementation monitoring of covered species would be done to confirm that no net loss of occurrences has been achieved. Because Bolander's water-hemlock is a noncovered species, the species protections afforded to covered species under CM22 would not apply to this species, and the effects of the BDCP on this species would be adverse. Implementation of Mitigation Measure BIO-169, *Apply* CM22 Avoidance and Minimization Measures *to noncovered special status plant species*, would reduce this effect.

CEQA Conclusion: Under Alternative 4, impacts on covered tidal wetland plants as a result of implementing the BDCP would not be significant. However, the loss of Bolander's water-hemlock populations in CZ 11 would be a significant impact. Implementation of Mitigation Measure BIO-169 would reduce this impact to a less-than-significant level.

Mitigation Measure BIO-169: Apply *CM22 Avoidance and Minimization Measures* to noncovered special-status plant species

Please see Mitigation Measure BIO-169 under Impact BIO-169.

Inland Dune Plants

Five special-status plants occur in inland dune habitat in the Study Area. None of the species is covered under the BDCP, and no habitat models were prepared for inland dune habitat. Table 12-4-66 summarizes the acreage of inland dune habitat in the Study Area and the number of occurrences of each special-status inland dune plant in the Study Area.

Table 12-4-66. Summary of Impacts on Inland Dune Plants under Alternative 4

	Acres in Study Area	Acres Affected	Occurrences in Study Area	Occurrences Affected	Impacts
Habitat					
Inland Dunes	20	0			None
Noncovered Species					
Hoover's cryptantha			1	0	None
Antioch Dunes					

buckwheat	1		
Mt. Diablo buckwheat	1	0	None
Contra Costa wallflower	3	0	None
Antioch Dunes evening-primrose	9	0	None

Impact BIO-174: Adverse effects on habitat and populations of inland dune plants

The BDCP would have no adverse effects on inland dune plants (Table 12-4-66). No construction activities or habitat restoration would take place where the species occur. No specific actions to benefit inland dune species are proposed.

CEQA Conclusion: Because the BDCP would not affect inland dune habitat, implementation of the BDCP would have no significant impacts on inland dune species. No mitigation is required.

Nontidal Wetland Plants

No covered plant species occur in nontidal wetlands in the Study Area; however, six noncovered special-status plant species occur in nontidal wetlands in the Study Area. Table 12-4-67 summarizes the acreage of nontidal wetland habitat in the Study Area and the number of occurrences of each special-status nontidal wetland plant in the Study Area.

Table 12-4-67. Summary of Impacts on Nontidal Wetland Plants under Alternative 4

	Acres in Study Area	Acres Affected	Occurrences in Study Area	Occurrences Affected	Impacts
Habitat					
Nontidal freshwater aquatic	5,587	298			Loss of habitat from construction of water conveyance facilities, tidal habitat restoration, and floodplain restoration
Nontidal freshwater perennial emergent wetland	1,369	101			Loss of habitat from construction of water conveyance facilities, tidal habitat restoration, Yolo Bypass Fisheries enhancements, and floodplain restoration
Noncovered Species					
Watershield			3	1	Loss of habitat from construction of water conveyance facilities
Bristly sedge			21	2	Loss of habitat from construction of water conveyance facilities
Woolly rose-mallow*			120	12	Loss of habitat from construction of water conveyance facilities and tidal habitat restoration
Eel grass pondweed			1	0	None
Sanford's arrowhead			23	2	Loss of habitat from construction of water conveyance facilities and tidal habitat restoration

Marsh skullcap*	3	0	None
*Also occurs in valley/foothill riparian habitat.			

Impact BIO-175: Adverse effects on habitat and populations of nontidal wetland plants

Under Alternative 4, known occurrences watershield, bristly sedge, woolly rose-mallow, and Sanford's arrowhead would be within the proposed footprint for the water conveyance facilities or within the hypothetical footprint for restoration activities and would be adversely affected. The BDCP would have no adverse effects on eel-grass pondweed or marsh skullcap.

- *CM1 Water Facilities and Operations*: Construction of the Alternative 4 water conveyance facilities would adversely affect four noncovered special-status plants occurring in nontidal wetlands. One of three watershield occurrences in CZ 5 on Bouldin Island could be affected by construction of the water conveyance facilities. This is a historical occurrence that has not been observed since 1893, and it may be extirpated (California Department of Fish and Game 2012mmmmm). Two occurrences of bristly sedge in CZ 4 and CZ 5, including approximately 1.54 acres of occupied habitat, would be affected by construction of the water conveyance facilities. Twelve occurrences of woolly rose-mallow would be affected. Three occurrences in CZ 3 would be removed during construction of the intake facilities, and five occurrences in CZ 6 and one occurrence in CZ 8 would be affected by construction of other facilities. Construction of the water conveyance facilities would remove occupied habitat at one occurrence of Sanford's arrowhead in CZ 5.
- *CM2 Yolo Bypass Fisheries Enhancement*: No known occurrences of special-status nontidal wetland plants are present in the hypothetical footprint for construction or operation of the Yolo Bypass fisheries enhancements. Therefore, construction and operation of the Yolo Bypass Fisheries enhancements would not affect special-status nontidal marsh plants.
- *CM3 Natural Communities Protection and Restoration*: No specific natural communities protection is proposed for nontidal wetlands under the BDCP. Therefore, no occurrences of special-status nontidal plants are proposed for protection.
- *CM4 Tidal Natural Communities Restoration*: One known occurrence of Sanford's arrowhead is present within areas that could be affected by tidal habitat restoration in CZ 2. One known occurrence of woolly rose-mallow is present within areas that could be affected by tidal habitat restoration in CZ 7. No other known occurrences of special-status nontidal wetland plants are present within areas proposed for tidal habitat restoration. Therefore, tidal habitat restoration could have adverse effects on two special-status nontidal wetland plants.
- *CM5 Seasonally Inundated Floodplain Restoration*: No known occurrences of special-status nontidal wetland plants are present within areas proposed for floodplain restoration. Therefore, floodplain restoration and construction of new floodplain levees would have no impacts on special-status nontidal wetland plants.
- *CM6 Channel Margin Enhancement*: No known occurrences of special-status nontidal wetland plants are present within areas proposed for channel margin habitat enhancement. Therefore, channel margin habitat enhancement would have no impacts on known occurrences of special-status nontidal wetland plants.

- *CM7 Riparian Natural Community Restoration*: No known occurrences of special-status nontidal wetland plants are present within areas proposed for riparian habitat restoration. Therefore, riparian habitat restoration would have no impacts on known occurrences of special-status nontidal wetland plants.
- *CM8 Grassland Natural Community Restoration*: No known occurrences of special-status nontidal wetland plants are present within areas proposed for grassland communities restoration. Therefore, grassland communities restoration would have no impacts on special-status nontidal wetland plants.
- *CM9 Vernal Pool and Alkali Seasonal Wetland Complex Restoration*: No known occurrences of special-status nontidal wetland plants are present within areas proposed for vernal pool complex restoration. Therefore, vernal pool complex restoration would have no impacts on special-status nontidal wetland plants.
- *CM10 Nontidal Marsh Restoration*: Nontidal marsh restoration would take place through conversion of agricultural lands. Therefore, nontidal marsh restoration would avoid existing nontidal marsh and would have no adverse effects on special-status nontidal wetland plants. The BDCP may benefit nontidal wetland species by creating 400 acres of nontidal freshwater marsh, including components of nontidal perennial aquatic and nontidal freshwater perennial emergent wetland communities, and by maintaining and enhancing the habitat functions of protected and created nontidal wetland habitats for covered and other native species. However, no specific actions to benefit noncovered species are proposed.

Because watershield, bristly sedge, woolly rose-mallow, and Sanford's arrowhead are not covered under the BDCP, the species protections afforded to covered species under CM22 do not apply to these species, and the effects of the BDCP on these species would be adverse. Implementation of Mitigation Measure BIO-169, *Apply* CM22 Avoidance and Minimization Measures *to noncovered special-status plant species*, would reduced these effects.

CEQA Conclusion: Under Alternative 4, construction of the water conveyance facilities could result in a reduction in the range and numbers of watershield, bristly sedge, woolly rose-mallow, and Sanford's arrowhead. Tidal habitat restoration could result in a reduction in the range and numbers of woolly rose-mallow and Sanford's arrowhead. These impacts would be significant. Implementation of Mitigation Measure BIO-169 would reduce these impacts to a less-than-significant level.

Mitigation Measure BIO-169: Apply *CM22 Avoidance and Minimization Measures* to noncovered special-status plant species

Please see Mitigation Measure BIO-169 under Impact BIO-169.

General Terrestrial Biology

Wetlands and Other Waters of the United States.

Alternative 4 actions would both permanently and temporarily remove or convert wetlands and open water that is potentially jurisdictional as regulated by USACE under Section 404 of the CWA. The following two impacts address the project-level effects of CM1 on these potential wetlands and waters, and the programmatic-level effects of other relevant conservation actions (CM2–CM10). CM11–CM22 would not directly result in loss or conversion of wetlands or other waters of the

United States. The methods used to conduct these analyses are described in Section 12.3.2.4 of this chapter.

Impact BIO-176: Effects of constructing water conveyance facilities (CM1) on wetlands and other waters of the United States

Construction of the Alternative 4 water conveyance facilities would both temporarily and permanently remove potential wetlands and other waters of the United States as regulated by Section 404 of the CWA (Tables 12-4-68 and 12-4-69). Based on the methodology used to conduct this analysis, the losses would occur at intake, tunnel, pipeline, canal, and muck and borrow/spoil disposal sites, transmission corridors, and multiple temporary work areas associated with the construction activity. The permanent wetland or other waters of the United States loss (186 acres assuming a north-south transmission corridor and 164 acres assuming an east-west transmission corridor) would occur at various locations along the pipeline/tunnel alignment. The majority of the loss would occur due to construction of Alternative 4's three intake structures along the eastern bank of the Sacramento River between Clarksburg and Courtland in the north Delta, and the tunnel muck disposal sites associated with tunnel construction at various locations, including on Andrus, Tyler, Venice and Bacon Islands. The temporary wetland effects (161 acres) would also occur mainly at the three intake construction sites along the eastern bank of the Sacramento River, and at barge unloading facilities in the San Joaquin and Middle Rivers.

Table 12-4-68. Loss of Potential Wetlands and Other Waters of the United States from Construction of Alternative 4 Water Conveyance Facilities (North-South Transmission Corridor)

Wetland/Other Water Type[a]	Permanent	Temporary	Total
Open Water			
Nontidal Flow	83	28	111
Muted Tidal Flow	2	<1	2
Tidal Flow	38	108	146
Pond or Lake (nontidal)	2	3	5
Wetland			
Nontidal Wetland	54	13	66
Tidal Wetland	8	5	13
Seasonal Wetland	<1	4	4
Total Impact Acres	**186**	**161**	**347**

Source: DWR 2013.
[a] Wetland types are described in the methods section of this chapter (Section 12.2.3.4).

Table 12-4-69. Loss of Potential Wetlands and Other Waters of the U.S. from Construction of Alternative 4 Water Conveyance Facilities (East-West Transmission Corridor)

Wetland/Other Water Type[a]	Permanent	Temporary	Total
Open Water			

Nontidal Flow	76	28	104
Muted Tidal Flow	1	<1	1
Tidal Flow	27	107	134
Pond or Lake (nontidal)	2	3	5
Wetland			
Nontidal Wetland	54	13	66
Tidal Wetland	4	5	9
Seasonal Wetland	<1	4	4
Total Impact Acres	**164**	**161**	**325**

Source: DWR 2013.

[a] Wetland types are described in the methods section of this chapter (Section 12.2.3.4).

The effects of constructing the eastern transmission corridor facilities rather than the north-south transmission corridor facilities would include fewer acres of permanent loss of nontidal flow (7 acres fewer), muted tidal flow (1 acre fewer), tidal flow (11 acres fewer), and tidal wetland (4 acres fewer). The reductions would occur due to the smaller acreage needed to place transmission tower piers along the much shorter Alternative 4 eastern transmission corridor.

The permanent and temporary loss of these potential jurisdictional wetlands as a result of constructing Alternative 4 water conveyance facilities would be a substantial adverse effect if not compensated by wetland protection and/or restoration. This loss would represent a removal of federally protected wetlands as defined by Section 404 of the CWA. However, Alternative 4 includes conservation measures (CM4 and CM10) that would restore and protect large acreages of both tidal and nontidal wetlands and open water in the study area. Through the course of the 40-year restoration program, this alternative would restore 65,000 acres of tidal and 1,200 acres of nontidal wetland or open water. Impacts to wetlands from CM1 construction would occur in the first 10 years after BDCP approval. Approximately 16,700 acres of this wetland restoration would occur during this time period, thereby offsetting the impacts of CM1 construction. These acreages greatly exceed the no net loss (1:1 replacement ratio) requirement for Alternative 4 with either an east-west corridor (347 acres) or a north-south transmission corridor (325 acres). Therefore, there would be an overall beneficial effect on potential jurisdictional wetlands and other waters of the United States from BDCP implementation.

CEQA Conclusion: The permanent and temporary loss of potential jurisdictional wetlands as a result of constructing Alternative 4 water conveyance facilities would be a significant adverse impact if not compensated for by wetland protection and/or restoration. This loss would represent either temporary or permanent removal of federally protected wetlands or other waters of the United States as defined by Section 404 of the CWA. However, Alternative 4 includes conservation measures (CM4 and CM10) that would restore and protect large acreages of both tidal and nontidal wetlands and open water. Through the course of the 40-year restoration program, this alternative would result in restoration of 65,000 acres of tidal and 1,200 acres of nontidal wetlands and open water. Impacts to wetlands from CM1 construction would occur in the first 10 years after BDCP approval. Approximately 16,700 acres of this wetland restoration would occur during this time period, thereby offsetting the impacts of CM1 construction. These acreages greatly exceed the no net loss (1:1 replacement ratio) requirement for Alternative 4 with an east-west transmission corridor (347 acres) and Alternative 4 with a north-south corridor (325 acres). Therefore, there would be a beneficial impact on potential jurisdictional wetlands and waters of the United States from BDCP implementation.

Impact BIO-177: Effects of implementing other conservation measures (CM2–CM10) on wetlands and other waters of the United States

The habitat protection and restoration activities associated with Alternative 4's other conservation measures (CM2–CM10) would alter the acreages and functions and values of wetlands and waters of the United States in the study area over the 40-year timeframe of implementing the BDCP conservation actions. Because these conservation measures have not been defined to the level of site-specific footprints, it is not possible to delineate and quantify these effects in detail. Several of the conservation measures (CM2, CM4, and CM5) have been described with theoretical footprints for purposes of the effects analysis contained in Chapter 5 of the BDCP. These theoretical footprints have been used to predict the acres of natural communities that would be affected through loss or conversion, which gives some indication of jurisdictional wetland effects. Any CM2–CM10 effects ascribed to tidal perennial aquatic, tidal brackish emergent, tidal freshwater emergent, other natural seasonal, nontidal freshwater perennial emergent, and nontidal perennial aquatic wetlands natural communities are likely to also be effects on wetlands and other waters of the United States. Effects ascribed to other natural communities and land cover types with small jurisdictional wetland components (valley/foothill riparian, alkali seasonal wetland complex, vernal pool complex, managed wetland, grassland and cultivated land) are not easily converted to effects on wetlands and other waters of the United States by the use of theoretical footprints. Because of this lack of detail, a programmatic assessment is provided for these other conservation measures.

The conversion of existing wetland natural communities to other types of wetland natural communities through implementation of CM2–CM10 for Alternative 4 would be in the range of 5,500 to 6,000 acres, assuming that 100% of the predominantly wetland natural communities listed in Table 12-4-68 and 69 and that 10% of all of the non-wetland natural communities listed in that table would qualify as wetlands or other waters of the United States under the CWA. Most of these wetlands would be converted to tidal and nontidal wetlands and open water through implementation of CM4, and CM10. The wetlands and open water created by these two restoration actions would be approximately 66,200 acres, far exceeding what is required under the no net loss policy used by the USACE in considering Section 404 permits, even if one were to assume that all conversions represented a functional wetland loss. Therefore, there would be a beneficial effect on potential jurisdictional wetlands and other waters of the United States from implementing CM2-CM10.

CEQA Conclusion: The permanent and temporary loss of potential jurisdictional wetlands as a result of implementing the other conservation measures (CM2–CM10) of Alternative 4 would be a significant adverse impact if not compensated for by wetland protection and/or restoration. This loss would represent a removal of federally protected wetlands or other waters of the United States as defined by Section 404 of the CWA. However, Alternative 4 includes conservation measures (CM4 and CM10) that would restore large acreages of both tidal and nontidal wetlands and open water in the study area. Over the life of the BDCP restoration program, this alternative would result in restoration of 66,200 acres of tidal and nontidal wetlands and open water, of which 16,700 acres would be restored in the first 10 years. These acreages greatly exceed the no net loss (1:1 replacement ratio) requirement for Alternative 4 (5,500–6,000 acres). Therefore, there would be a beneficial impact on potential jurisdictional wetlands and other waters of the United States from implementing CM2-CM10.

Shorebirds and Waterfowl

Managed wetlands, tidal natural communities, and cultivated lands (primarily rice and corn) provide freshwater nesting, feeding, and resting habitat for a large number of Pacific flyway waterfowl and shorebirds. The primary effects of concern for shorebirds and waterfowl are related to the conversion of managed wetland and cultivated lands to tidal marsh associated with habitat restoration. Ducks Unlimited (2012) conducted an analysis to determine the effects of BDCP conservation measures on waterfowl and shorebird habitat, as well as to determine whether BDCP actions would impede attainment of the goals established by the Central Valley Joint Venture (CVJV) Implementation Plan for the Delta, Yolo, and Suisun Marsh drainage basins. The CVJV efforts are guided by its 2006 Implementation Plan, which is founded on the principles of strategic habitat conservation (Central Valley Joint Venture 2006). Those principles emphasize the establishment of population abundance objectives and the use of species-habitat models to link population objectives to habitat needs. The CVJV has used species-habitat models to translate bird abundance objectives into habitat objectives, while explicitly identifying the biological assumptions that underpin these models and the data used to populate them. As a result, the CVJV's biological planning provides a framework for evaluating the effects of the BDCP on waterfowl and shorebirds.

The Ducks Unlimited waterfowl analysis focused primarily on dabbling ducks. Less than 5% of all geese in the Central Valley occur in the Yolo, Delta, and Suisun Marsh drainage basins. Moreover, geese in the Central Valley rely mostly on agricultural habitats to meet their food energy needs. The BDCP's effect on agricultural habitats is limited to the Delta Basin where about 2500 acres of corn now available to geese will be converted to other habitats (Table 5, Ducks Unlimited 2012). Food supplies for geese would still be well in excess of demand even with the loss of these agricultural habitats (Central Valley Joint Venture 2006, Ducks Unlimited 2012). The duck population objectives used in the analysis were taken directly from the CVJV Plan. Dabbling duck species make up 92% of this objective, while diving duck species make up the remaining 8%. Thus, the results were mostly driven by dabbling duck needs and largely interpreted in the context of dabbling duck foraging ecology. The 55,000 acres of Tidal Natural Communities Restoration (CM4) would be expected to benefit diving ducks by providing deep water foraging habitat.

Refer to the Ducks Unlimited Report (Ducks Unlimited 2012) for details of the analysis and methods with respect to the TRUMET model used to quantify effects on food biomass and food quality.

Impact BIO-178: Loss or conversion of habitat for waterfowl and shorebirds as a result of water conveyance facilities construction

Development of the water conveyance facility would result in the permanent removal of approximately 3 acres of managed wetland and 1,128 acres of corn. In addition, 8 acres of managed wetland and 330 acres of corn would be temporarily removed. One acre of rice would be temporarily removed as a result of constructing the water conveyance facilities. These losses of habitat would not have an adverse effect on shorebirds and waterfowl because the habitat removed represents a small proportion of available habitat in the Plan Area. In addition, the protection of 14,600 acres of non rice cultivated lands and 300 acres of rice in the near-term from *Natural Communities Restoration and Protection (CM3)* would benefit waterfowl and shorebirds.

Construction activities could have an adverse effect on nesting shorebirds or waterfowl if they were present in or adjacent to work areas and could result in destruction of nests or disturbance of nesting and foraging behaviors. Mitigation Measure BIO-75, *Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds*, would be available to minimize potential adverse effects on nesting birds.

CEQA Conclusion: Habitat loss from construction of the water conveyance facility would have a less-than-significant impact on shorebirds and waterfowl. Construction activities could have a significant impact on nesting shorebirds and waterfowl if they were present in or adjacent to work areas, resulting in destruction of nests or disturbance of nesting and foraging behaviors. Mitigation Measure BIO-75, *Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds*, would minimize potentially significant impacts on nesting birds.

Mitigation Measure BIO-75: Conduct preconstruction nesting bird surveys and avoid disturbance of nesting birds

See Mitigation Measure BIO-75 under Impact BIO-75.

Impact BIO-179: Loss or conversion of habitat for wintering waterfowl as a result of implementation of conservation components

Suisun Marsh: Managed seasonal wetlands in Suisun Marsh would be reduced by an estimated 8,818 acres as a result of the BDCP. This would represent a 25% decrease in managed seasonal wetlands compared to long-term conditions without project (Ducks Unlimited 2012, Table 5). There is considerable uncertainty about the biomass and nutritional quality of waterfowl foods produced in Suisun Marsh's managed wetlands, which makes it difficult to identify the amount of mitigation needed. To address this uncertainty, three levels of food biomass and three levels of nutritional quality were modeled for these existing habitats (Ducks Unlimited 2012, Table 7). Three mitigation scenarios were based on these energetic assumptions of biomass and food quality were then run to determine a minimum acreage of managed seasonal wetlands to be protected and enhanced to compensate for the loss of productivity from habitat conversion to tidal wetlands.

Scenario 1) Assume that existing managed seasonal wetlands provide low food biomass and low food quality. Under this assumption, the managed seasonal wetlands in Suisun Marsh produce 50% of the seed biomass of seasonal wetlands elsewhere in the Central Valley, and these seeds have 60% of the metabolizable energy of seeds produced outside of Suisun Marsh. Given the assumption that managed seasonal wetlands in Suisun Marsh could be enhanced to provide high food biomass and high food quality (equal to wetlands in the Central Valley), 5,000 acres of managed wetlands protected and managed for high biomass and high food quality would mitigate for the conversion of 8,857 acres of managed seasonal wetland to tidal marsh.

Scenario 2) Assume that the managed seasonal wetlands lost provide medium food biomass and medium food quality. Under this assumption, the managed seasonal wetlands in Suisun Marsh produce 75% of the seed biomass of seasonal wetlands elsewhere in the Central Valley, and these seeds have 80% of the metabolizable energy of seeds produced outside of Suisun Marsh. Given the assumption that managed seasonal wetlands in Suisun Marsh could be enhanced to provide high food biomass and high food quality (equal to wetlands in the Central Valley), 13,300 acres of managed wetlands protected and managed for high biomass and high food quality would mitigate for the conversion of 8,857 acres of managed seasonal wetland to tidal marsh.

Scenario 3) Assume that existing managed seasonal wetlands provide low food biomass and low food quality. Given the assumption that managed seasonal wetlands in Suisun Marsh could only be enhanced to provide medium food biomass and medium food quality (produce 75% of the seed biomass of seasonal wetlands elsewhere in the Central Valley, and these seeds have 80% of the metabolizable energy of seeds produced outside of Suisun Marsh), 8,800 acres of managed wetlands protected and managed for medium biomass and medium food quality would mitigate for the conversion of 8,857 acres of managed seasonal wetland to tidal marsh.

The BDCP has committed to protecting and enhancing a minimum of 5,000 acres of managed seasonal wetlands in Suisun Marsh to compensate for the loss of productivity from habitat conversion to tidal marsh. This minimum commitment of 5000 acres would mitigate for the reduced productivity from conversion of managed seasonal wetlands under the assumptions that 1) existing managed seasonal wetlands on average in Suisun Marsh provide low biomass and low-quality food to wintering waterfowl and 2) protected seasonal wetlands can be managed to produce high biomass and high food quality. However, the food biomass and productivity in Suisun Marsh would need to be quantified in order to determine if the 5,000 acres was sufficient to avoid an adverse effect on wintering waterfowl in the Suisun Marsh, or if additional mitigation would be needed. Mitigation Measure BIO-179a, *Conduct food studies and monitoring for wintering waterfowl in Suisun Marsh*, would be available to address this potential adverse effect.

Yolo and Delta Basins: The replacement of 1,400 acres of managed seasonal wetland with 19,000 acres of palustrine tidal wetlands in the Delta Watershed, and the replacement of 600 acres of managed seasonal wetlands with 2,000 acres of palustrine tidal wetlands in the Yolo Watershed would not be expected to have an adverse effect on food productivity, under the assumption that these wetlands would provide adequate food sources. However, a monitoring component and a food study in these tidal habitats would be necessary order to demonstrate that there is a less-than-significant loss of food value in these habitats for wintering waterfowl. If it is determined from monitoring, that there is in fact a significant loss in food productivity from habitat conversion to tidal wetlands, the protection and enhancement of managed wetlands in these watersheds would be required to mitigate for the change in food biomass and quality. Mitigation Measure BIO-179b, *Conduct food studies and monitoring to demonstrate food quality of palustrine tidal wetlands in the Yolo and Delta Basins*, would be available to address this uncertainty.

CEQA Conclusion: There is considerable uncertainty about the biomass and nutritional quality of waterfowl foods produced in Suisun Marsh's managed wetlands, which makes it difficult to identify the amount of mitigation needed. The BDCP has committed to protecting and enhancing a minimum of 5,000 acres of managed seasonal wetlands in Suisun Marsh to compensate for the loss of productivity from habitat conversion to tidal marsh. This minimum commitment of 5000 acres would mitigate for the reduced productivity from conversion of managed seasonal wetlands under the assumptions that 1) existing managed seasonal wetlands on average in Suisun Marsh provide low biomass and low-quality food to wintering waterfowl and 2) protected seasonal wetlands can be managed to produce high biomass and high food quality. However, the food biomass and productivity in Suisun Marsh would need to be quantified in order to determine if the 5,000 acres was sufficient to avoid having a significant impact on wintering waterfowl in the Suisun Marsh, or if additional mitigation would be needed. Mitigation Measure BIO-179a, *Conduct food studies and monitoring for wintering waterfowl in Suisun Marsh*, would address this potentially significant impact.

The replacement of 1,400 acres of managed seasonal wetland with 19,000 acres of palustrine tidal wetlands in the Delta Watershed, and the replacement of 600 acres of managed seasonal wetlands with 2,000 acres of palustrine tidal wetlands in the Yolo Watershed would not be expected to alter food productivity and therefore have significant impact on wintering waterfowl, under the assumption that these wetlands would provide adequate food sources. However, these results are entirely dependent on assumptions about food production in palustrine tidal habitats. Studies of food biomass and food quality in palustrine tidal habitats are needed to confirm that no mitigation for wintering waterfowl is required in the Yolo and Delta Basins. Mitigation Measure BIO-179b, *Conduct food studies and monitoring to demonstrate food quality of palustrine tidal wetlands in the Yolo and Delta Basins*, would address this uncertainty and avoid a potentially significant impact on wintering waterfowl.

Mitigation Measure BIO-179a: Conduct food studies and monitoring for wintering waterfowl in Suisun Marsh

Poorly managed wetlands (considered low biomass and food quality) will be identified and managed to improve food quality and biomass. Studies will be required to quantify 1) food production of existing managed wetlands in Suisun Marsh and 2) energetic productivity of brackish and tidal marsh habitats. Protected wetlands will be monitored to measure changes in the energetic productivity of these sites. Based on the food studies and monitoring results, it will be determined if the minimum commitment of 5,000 acres is sufficient to meet the goal of 1:1 compensation for loss of wintering waterfowl habitat with the protection and management of managed wetlands in perpetuity. If monitoring demonstrates that additional acreage is needed to meet this goal, additional acreage of protection or creation of managed wetlands and management will be required.

Mitigation Measure BIO-179b: Conduct food studies and monitoring to demonstrate food quality of palustrine tidal wetlands in the Yolo and Delta Basins

In order to address the uncertainty of the impact of loss of managed wetlands in the Yolo and Delta Basins on wintering waterfowl, food studies and monitoring must be conducted to demonstrate the food quality of palustrine tidal habitats in these basins. If studies show that the assumption of no effect was inaccurate, and the food quality goal of 1:1 compensation for wintering waterfowl food value is not met, additional acreage of protection or creation of managed wetland and management will be required.

Impact BIO-180: Loss or conversion of habitat for breeding waterfowl

Yolo and Delta Basins: The BDCP would reduce managed wetlands in the Yolo and Delta basins by 589 acres and 1358 acres respectively. Under the assumption that 15% of these wetlands are managed as semi-permanent wetlands, the BDCP would reduce semi-permanent wetlands in the Yolo and Delta drainage basins by 88 acres and 204 acres respectively. While a reduction in these semi-permanent habitats would represent a habitat loss for breeding waterfowl, with the restoration of over 21,000 acres of palustrine tidal wetlands in the Yolo and Delta basins there would be a less than adverse effect on breeding waterfowl. These palustrine habitats would presumably contain water during the breeding period (i.e. March through July), and would be expected to compensate for the loss of 392 acres of managed semi-permanent wetlands in the Yolo and Delta watersheds attributed to the BDCP.

Suisun Marsh: Total managed wetlands in Suisun Marsh would decline from 41,012 acres to 30,640 acres with the conversion of managed seasonal and semi-permanent wetlands to tidal habitats. Some of the remaining seasonal wetlands could be managed as semi-permanent wetlands to offset the loss of breeding habitat, but this could further reduce food supplies available to wintering waterfowl under the assumption that semi-permanent wetlands provide few food resources compared to seasonally managed habitats. Food studies and monitoring would be necessary to determine 1) the capacity of semi-permanent wetlands to provide breeding habitat functions *and* significant food resources for wintering waterfowl and 2) how increases in tidal marsh and salinity levels would affect the overall reproductive capacity of the marsh. These studies would be needed in order to quantify impacts to breeding waterfowl in Suisun Marsh and to determine not only the number of acres that would mitigate for loss of breeding habitat at a ratio of 1:1, but how those acres should be managed. For example, if some seasonal wetlands could be managed to produce food at the medium food biomass-medium food quality level (produce 75% of the seed biomass of seasonal wetlands elsewhere in the Central Valley, and seeds that have 80% of the metabolizable energy of seeds produced outside of Suisun Marsh), they could be integrated into mitigation strategies intended to offset declines in wintering waterfowl food supplies. These semi-permanent wetlands would be managed in perpetuity to encourage the types of perennial wetland species capable of producing significant amounts of food for wintering waterfowl. Mitigation Measure BIO-180 *Conduct food and monitoring studies of breeding waterfowl in Suisun Marsh*, would be available to address the uncertainty of this impact.

CEQA Conclusion: The BDCP would reduce managed wetlands in the Yolo and Delta basins by 589 acres and 1358 acres respectively. Under the assumption that 15% of these wetlands are managed as semi-permanent wetlands, the BDCP would reduce semi-permanent wetlands in the Yolo and Delta drainage basins by 88 acres and 204 acres respectively. While a reduction in these semi-permanent habitats would represent a habitat loss for breeding waterfowl, with the restoration of over 21,000 acres of palustrine tidal wetlands in the Yolo and Delta basins there would be a less-than-significant impact on breeding waterfowl. These palustrine habitats would presumably contain water during the breeding period (i.e. March through July), and would be expected to compensate for the loss of 392 acres of managed semi-permanent wetlands in the Yolo and Delta watersheds attributed to the BDCP. Total managed wetlands in Suisun Marsh would decline from 41,012 acres to 30,640 acres with the conversion of managed seasonal and semi-permanent wetlands to tidal habitats. Some of the remaining seasonal wetlands could be managed as semi-permanent wetlands to offset the loss of breeding habitat, but this could further reduce food supplies available to wintering waterfowl under the assumption that semi-permanent wetlands provide few food resources compared to seasonally managed habitats. Food studies and monitoring would be necessary to determine 1) the capacity of semi-permanent wetlands to provide breeding habitat functions *and* significant food resources for wintering waterfowl and 2) how increases in tidal marsh and salinity levels would affect the overall reproductive capacity of the marsh. Mitigation Measure BIO-180 *Conduct food and monitoring studies of breeding waterfowl in Suisun Marsh*, would address the uncertainty of model assumptions and reduce the potentially significant impact of habitat conversion on breeding waterfowl in Suisun Marsh.

Mitigation Measure BIO-180: Conduct food and monitoring studies of breeding waterfowl in Suisun Marsh

In order to address the uncertainty of the impact of loss of managed wetlands in Suisun Marsh on breeding waterfowl, food studies and monitoring must be conducted to determine 1) the capacity of semi-permanent wetlands to provide breeding habitat functions *and* significant food resources for wintering waterfowl and 2) how increases in tidal marsh and salinity levels will affect the overall reproductive capacity of the marsh.

The required directed studies would examine:

1) The capacity of managed semi-permanent / permanent wetlands to support breeding waterfowl and produce significant amounts of food for wintering waterfowl
2) How increases in tidal marsh and salinity levels will affect the overall reproductive capacity of the Marsh? Reproductive studies will address but will not be limited to the following questions:

   How does the distribution of breeding waterfowl in Suisun Marsh differ in tidal versus managed habitats and across salinity gradients?

   How does waterfowl nest success and nest density vary with respect to tidal versus managed habitats and across salinity gradients?

   What are the patterns of habitat selection and movements by waterfowl broods in relation to tidal vs. managed habitats, and are there impacts on duckling survival?

   What is the current relationship between waterfowl reproductive success and interactions with alternate prey and predators, and how is tidal restoration likely to alter these relationships (Chappell et al. 2004)?

Impact BIO-181: Loss or conversion of habitat for shorebirds

Approximately 10% of all wintering shorebirds in the Central Valley occur in the Yolo and Delta Basins. The CVJV Plan (Central Valley Joint Venture 2006) assumes that food is the primary need of shorebirds during migration and winter and that providing adequate foraging habitat at appropriate water depths would enhance survival outside of the breeding season. Wintering shorebirds in the Central Valley rely on managed seasonal wetlands, managed semi-permanent wetlands, and harvested rice fields that are intentionally flooded to provide wildlife benefits and/or promote straw decomposition. The CVJV used the bioenergetic model TRUEMET to determine how much wetland and agricultural habitat must be present at depths less than 10 cm to meet the food energy needs of shorebirds in the Yolo and Delta Basins.

The BDCP would reduce seasonal and semi-permanent managed wetlands in the Yolo and Delta Basins by approximately 1,872 acres (Ducks Unlimited 2012, Table 5). Thus, the "pool" of managed wetlands that can potentially provide adequate foraging depths to shorebirds would be reduced 11% from 16,554 acres to 14,682 acres. However, palustrine tidal wetlands in the Yolo and Delta Basins would increase from 15,903 acres to 36,564 acres for a gain of nearly 21,000 acres (Ducks Unlimited 2012, Table 5). Although it is unknown what fraction of these 21,000 acres would provide shorebird foraging habitat, preliminary conclusions suggest that this gain in palustrine tidal wetlands is likely to offset the loss of shorebird foraging habitat that results from a reduction in managed wetlands. However, actual studies of the foraging opportunities provided by palustrine tidal habitats would be needed before concluding that no mitigation is required. The BDCP would not significantly reduce shorebird habitat now provided by winter-flooded rice fields (Ducks Unlimited Table 5). Shorebird conservation objectives were not established for Suisun Marsh because bird counts do not exist for this Basin. However, Suisun Marsh does provide habitat for wintering shorebirds and the following conservation actions identified in the Southern Pacific

Shorebird Conservation Plan were cited in the CVJV Plan; 1) incorporate shorebird habitat components in tidal marsh restorations, 2) increase tidal circulation and water quality in marshes to enhance invertebrate productivity and shorebird foraging areas, 3) manage vegetation in some ponds to provide expanses of open habitat, and 4) create one to six inches of water depths in some ponds. Tidal restoration would be expected to benefit shorebirds in Suisun Marsh. However, similarly to the Yolo and Delta Basins, studies of foraging opportunities in Suisun Marsh would be needed to quantify current conditions in order to determine the potential impacts of habitat conversion. Mitigation Measure BIO-181, *Conduct studies to quantify shorebird food resources and habitat value in tidal wetlands*, would be available to address the uncertainty of this impact.

CEQA Conclusion: Approximately 10% of all wintering shorebirds in the Central Valley occur in the Yolo and Delta Basins. Wintering shorebirds in the Central Valley rely on managed seasonal wetlands, managed semi-permanent wetlands, and harvested rice fields that are intentionally flooded to provide wildlife benefits and/or promote straw decomposition. The BDCP would reduce seasonal and semi-permanent managed wetlands in the Yolo and Delta Basins by approximately 1,872 acres (Ducks Unlimited 2012, Table 5). Thus, the "pool" of managed wetlands that can potentially provide adequate foraging depths to shorebirds would be reduced 11% from 16,554 acres to 14,682 acres. However, palustrine tidal wetlands in the Yolo and Delta Basins would increase from 15,903 acres to 36,564 acres for a gain of nearly 21,000 acres (Ducks Unlimited 2012, Table 5). Although it is unknown what fraction of these 21,000 acres would provide shorebird foraging habitat, preliminary conclusions suggest that this gain in palustrine tidal wetlands is likely to offset the loss of shorebird foraging habitat that results from a reduction in managed wetlands. However, actual studies of the foraging opportunities provided by palustrine tidal habitats would be needed before concluding that no mitigation is required. The BDCP would not significantly reduce shorebird habitat now provided by winter-flooded rice fields (Ducks Unlimited Table 5). Shorebird conservation objectives were not established for Suisun Marsh because bird counts do not exist for this Basin. However, Suisun Marsh does provide habitat for wintering shorebirds and the following conservation actions identified in the Southern Pacific Shorebird Conservation Plan were cited in the CVJV Plan; 1) incorporate shorebird habitat components in tidal marsh restorations, 2) increase tidal circulation and water quality in marshes to enhance invertebrate productivity and shorebird foraging areas, 3) manage vegetation in some ponds to provide expanses of open habitat, and 4) create one to six inches of water depths in some ponds. Tidal restoration would be expected to benefit shorebirds in Suisun Marsh. However, similarly to the Yolo and Delta Basins, studies of foraging opportunities in Suisun Marsh would be needed to quantify current conditions in order to determine the potential impacts of habitat conversion. Mitigation Measure BIO-181, *Conduct studies to quantify shorebird food resources and habitat value in tidal wetlands*, would be available to address the uncertainty of this potentially significant impact.

Mitigation Measure BIO-181: Conduct studies to quantify shorebird food resources and habitat value in tidal wetlands

A directed study of food resources in tidal wetlands will be conducted to confirm that no mitigation is necessary for wintering shorebirds. If tidal wetlands are shown to provide less suitable habitat than managed wetlands for shorebirds (e.g. reduced breeding habitat for black-necked stilt, or American avocet), specific management activities to enhance created or protected managed wetlands will be required to improve shorebird habitat.

Common Wildlife and Plants

Common wildlife and plants are widespread, often abundant, species that are not covered under laws or regulations that address conservation or protection of individual species. Examples of common wildlife and plants occurring in the study area are provided within the discussion for each natural community type in the Environmental Setting/Affected Environment section of this chapter. Impacts on common wildlife and plants would occur through the same mechanisms discussed for natural communities and special-status wildlife and plants for each alternative.

Impact BIO-182: Effects on habitat and populations of common wildlife and plants

Effects on habitat of common wildlife and plants, including habitat removal and conversion, are described and discussed in Section 12.3.3.2, which addresses impacts of Alternative 1B on natural communities. In general, effects on habitat of common wildlife and plants would not be adverse because they would be greatly offset by protection, restoration and other conservation activities contained in the BDCP, including *CM3 Natural Communities Protection and Restoration*, *CM4 Tidal Natural Communities Restoration*, *CM5 Seasonally Inundated Floodplain Restoration*, *CM6 Channel Margin Enhancement*, *CM7 Riparian Natural Community Restoration*, *CM8 Grassland Natural Community Restoration*, *CM9 Vernal Pool and Alkali Seasonal Wetland Complex Restoration*, *CM10 Nontidal Marsh Restoration*, and *CM11 Natural Communities Enhancement and Management*. In addition, the AMMs contained in Appendix 3.C of the BDCP are in place to reduce or eliminate the potential to adversely affect both special-status and common wildlife and plants.

Direct effects on common wildlife and plants from constructing water conveyance facilities and implementing BDCP conservation measures would include construction or inundation-related disturbances that result in injury or mortality of wildlife or plants and the immediate displacement of wildlife. Indirect effects include project-related disturbances to nearby wildlife and plants during construction (e.g., disruption of breeding and foraging behaviors, fugitive dust, runoff) and effects occurring later in time (e.g., collisions of birds with transmission lines, habitat fragmentation). Indirect effects could result both from construction and from operations and maintenance (e.g., ground disturbances could result in the spread and establishment of invasive plants or noxious weeds). These effects would not be adverse because conservation measures to avoid or minimize effects on special-status species, to prevent the introduction and spread of invasive species, and to enhance natural communities would result in avoiding and minimizing effects on common wildlife and plants as well.

CEQA Conclusion: Construction and operation of the water conveyance facilities and habitat restoration activities would have impacts on common wildlife and plants in the study area through habitat loss and through direct or indirect loss or injury of individuals. The loss of habitat would not be substantial, because habitat restoration would increase the amount and extent of habitat available for use by common wildlife and plant species. Conservation measures to avoid or minimize effects on special-status species, to prevent the introduction and spread of invasive species, and to enhance natural communities also would result in avoiding and minimizing effects on common wildlife and plants. Consequently, implementation of the BDCP is not expected to cause any populations of common wildlife or plants to drop below self-sustaining levels, and this impact would be less than significant. No mitigation would be required.

Wildlife Corridors

Essential Connectivity Areas (ECAs) are lands likely to be important to wildlife movement between large, mostly natural areas at the state wide level. The ECAs form a functional network of wildlands that are considered important to the continued support of California's diverse natural communities. Four general areas were identified within the study area that contain ECAs (Figure 12-2).

Impact BIO-183: Effect of Alternative 4 BDCP covered activities on wildlife corridors

Alternative 4 water conveyance facilities would cross two of the ECAs identified during the analysis, the Stone Lake-Yolo Bypass ECA and the Mandeville Island-Staten Island ECA. The construction of Intakes 1 and 2, and associated borrow and muck areas, just east of Clarksburg, would occur within the Stone Lake-Yolo Bypass ECA. These activities would result in the permanent loss of narrow strips of riparian vegetation along the Sacramento River and the permanent and temporary loss of cultivated lands. These habitat loses would not substantially impede the movement of any wildlife that could move from Stone Lakes to Yolo Bypass because the Sacramento River and Sacramento River Deep Water Ship Channel already create a barrier to dispersal for non-avian species; however it would create local barriers between Stone Lakes and the east bank of the Sacramento River. Though the loss of the narrow strips of riparian vegetation and cultivated lands would not substantially impede the movement of bird species between these areas the addition of new transmission lines could adversely affect birds during periods of low visibility. Sandhill cranes that are known to roost at Stones Lakes could particularly be adversely affected by the addition of the north-south running transmission line to the west of Stone Lakes (see impact discussions for greater and lesser sandhill cranes). No records of wildlife species were identified within these construction footprints, though there are several records for Swainson's hawk in the vicinity. Though there would be losses in Swainson's hawk foraging habitat and potential nesting habitat in these areas, these loses would not substantially impede the movements of Swainson's hawks in the area. The loss in habitat is addressed in the Swainson's hawk effects analysis.

The Alternative 4 transmission line would also pass through the Mandeville Island-Staten Island ECA, which also has several know roost locations for greater sandhill crane. As discussed above, the transmission lines could adversely affect the movement of cranes and other bird species during periods of low visibility. The conveyance alignment at this location would be within the pipeline and thus not create a barrier to wildlife movement.

Alternative 4 conveyance facilities would create some localized disruption in wildlife movement and the transmission lines would create additional barriers to movement for avian species during periods of low visibility. However, overall the Alternative 4 alignment would not create substantial barriers to movement between ECAs because the majority of the alignment consists of a tunnel that would be beneath riparian corridors, which are the most likely dispersal routes for terrestrial animals in the majority of the study area, and because the large surface impacts (the intakes and the Byron Tract Forebay) are in areas that already have barriers to movement for non-avian terrestrial species (Sacramento River and Sacramento River Deep Water Ship Channel; and the Clifton Court Forebay and associated canals).

Restoration activities would occur in the ECAs within Yolo Bypass (*CM2 Yolo Bypass Fisheries Enhancement*) and within the Grizzly Island-Lake Marie ECA (CM4 Tidal Natural Communities Restoration). These activities would generally improve the movement of wildlife within and outside of the study area. In addition, the preservation of restored lands (CM3) and the enhancement and management of these areas (CM11) would improve and maintain wildlife corridors within the study area.

Alternative 4 conveyance facilities would create local barriers to dispersal but overall the restoration activities would improve opportunities for wildlife dispersal within the study area and between areas outside of the study area and therefore overall Alternative 4 would not adversely affect wildlife corridors.

The eastern transmission line option for Alternative 4 would cross into the Bear Slough-Browns Creek ECA, crossing the Cosumnes River in two locations where there are there is a wide, mature riparian corridor. The removal of two portions of the riparian corridor along the Cosumnes River would create breaks in the mature canopy making wildlife dependent on riparian cover for dispersal more vulnerable to predation. The eastern transmission line option would also cross potential flights paths for sandhill cranes that are known to roost to south and east of the transmission line, which could affect cranes and other birds during periods of low visibility.

Alternative 4 with the eastern transmission would result in an adverse effect to a wildlife corridor because it will disrupt high quality riparian habitat within the Bear Slough-Browns Creek ECA. The realignment of this transmission option outside of the Cosumnes riparian corridor would reduce these effects.

CEQA Conclusion: Alternative 4 conveyance facilities would create some localized disruption in wildlife movement and the transmission lines would create additional barriers to movement for avian species during periods of low visibility. However, overall the Alternative 4 alignment would not create substantial barriers to movement between ECAs because the majority of the alignment consists of a tunnel that would be beneath riparian corridors, which are the most likely dispersal routes for terrestrial animals in the majority of the Plan Area, and because the large surface impacts, (the intakes and the Byron Tract Forebay) are in areas that already have barriers to movement for non-avian terrestrial species (Sacramento River and Sacramento River Deep Water Ship Channel; and the Clifton Court Forebay and associated canals).

Restoration activities would occur in the ECAs within Yolo Bypass (*CM2 Yolo Bypass Fisheries Enhancement*) and within the Grizzly Island-Lake Marie ECA (*CM4 Tidal Natural Community Communities Restoration*). These activities would generally improve the movement of wildlife within and outside of the Plan Area. In addition, the preservation of restored lands (CM3) and the enhancement and management of these areas (CM11) would improve and maintain wildlife corridors within the study area.

Alternative 4 conveyance facilities would create local barriers to dispersal and create barriers to safe movement of avian species during periods of low visibility but overall the restoration activities would improve opportunities for wildlife dispersal within the study area and between areas outside of the study area and therefore overall Alternative 4 would result in less-than significant impacts to wildlife corridors.

The eastern transmission line option for Alternative 4 would cross into the Bear Slough-Browns Creek ECA, crossing the Cosumnes River in two locations where there are there is a wide, mature riparian corridor. The removal of two portions of the riparian corridor along the Cosumnes River would create breaks in the mature canopy making wildlife dependent on riparian cover for dispersal more vulnerable to predation. The eastern transmission line option would also cross potential flights paths for sandhill cranes that are known to roost to south and east of the transmission line, which could affect cranes and other birds during periods of low visibility.

Alternative 4 with the eastern transmission would result in potentially significant impact to a wildlife corridor because it will disrupt high quality riparian habitat within the Bear Slough-Browns Creek ECA. The realignment of this transmission option outside of the Cosumnes riparian corridor would reduce this impact to less-than significant.

Invasive Plant Species

The invasive plant species that primarily affect each natural community in the study area, which include water hyacinth, perennial pepperweed, giant reed, Brazilian waterweed, are discussed in Section 12.1.4. Invasive species compete with native species for resources and can alter natural communities by altering fire regimes, hydrology (e.g., sedimentation and erosion), light availability, nutrient cycling, and soil chemistry (California Invasive Plant Council 2006:1). Invasive species also have the potential to harm human health and the economy by adversely affecting natural ecosystems, water delivery, flood protection systems, recreation, agricultural lands, and developed areas (California Department of Fish and Game 2008a: ix, xi). The construction and restoration activities covered under the BDCP could result in the introduction or spread of invasive plant species by creating temporary ground disturbance that provides opportunities for colonization by invasive plants in the Plan Area.

The primary mechanisms for the introduction of invasive plants as the result of implementation of the BDCP are listed here.

- Grading, excavation, grubbing, and placement of fill material.
- Breaching, modification, or removal of existing levees and construction of new levees.
- Modification, demolition, and removal of existing infrastructure (e.g., buildings, roads, fences, electric transmission and gas lines, irrigation infrastructure).
- Maintenance of infrastructure.
- Removal of existing vegetation and planting/seeding of vegetation.
- Maintaining vegetation and vegetation structure (e.g., grazing, mowing, burning, trimming).
- Dredging waterways.

Clearing operations and the movement of vehicles, equipment, and construction materials in the study area would facilitate the introduction and spread of invasive plants by bringing in or moving seeds and other propagules. These effects would result from four activities.

- Spreading chipped vegetative material from clearing operations over topsoil after earthwork operations are complete.
- Importing, distributing, storing, or disposing of fill, borrow, spoil, or dredge material.
- Traffic from construction vehicles (e.g., water and cement trucks) and personal vehicles of construction staff.
- Transport of construction materials and equipment within the study area and to/from the study area.

Table 12-4-70 lists the acreages of temporary disturbance in each natural community in the study area that would result from implementation of Alternative 4.

Table 12-4-70. Summary of Temporary Disturbance in Natural Communities under Alternative 4

Natural Community	Temporary Impacts (acres)
Tidal perennial aquatic	125
Tidal brackish emergent wetland	--
Tidal freshwater emergent wetland	6
Valley foothill riparian	209
Grassland	452
Inland dune scrub	--
Alkali seasonal wetland complex	--
Vernal pool complex	--
Other natural seasonal wetland	--
Nontidal freshwater perennial emergent wetland	2
Nontidal perennial aquatic	35
Managed wetlands	50
Agricultural lands	3,721
Total	**4,600**

Impact BIO-184: Adverse effects on natural communities resulting from the introduction and spread of invasive plant species

Under Alternative 4, the BDCP would have adverse effects on natural communities as a result of the introduction and spread of invasive plant species through implementation of CM1–CM10 and AMM6 of CM22. No adverse effects are expected from implementation of CM11–CM21.

- *CM1 Water Facilities and Operations*: Construction of the Alternative 4 water conveyance facilities would result in the temporary disturbance of 2,520 acres that would provide opportunities for colonization by invasive plant species.
- *CM2 Yolo Bypass Fisheries Enhancements*: Construction of the Yolo Bypass fisheries enhancements would result in the temporary disturbance of 757 acres that would provide opportunities for colonization by invasive plant species. Vegetation maintenance activities for the Fremont Weir and Yolo Bypass improvements may include the removal of giant reed; however, the clearing of linear areas to facilitate water flow may also result in increased opportunities for invasion. Sediment removal, transportation, and application as a source material for restoration or levee projects as part of Fremont Weir and Yolo Bypass maintenance activities could also result in the spread of invasives if the sediment contains viable invasive plant propagules.
- *CM3 Natural Communities Protection and Restoration*: The restoration activities in the natural communities located in the eleven CZs would result in the temporary disturbance of restoration areas that would provide opportunities for colonization by invasive plant species.
- *CM4 Tidal Natural Communities Restoration*: The activities associated with the restoration of tidal perennial aquatic, tidal mudflat, tidal freshwater emergent wetland, and tidal brackish emergent wetland in ROAs would result in the temporary disturbance of tidal areas that would provide opportunities for colonization by invasive plant species. These adverse effects would be reduced by designing restoration projects to minimize the establishment of nonnative

submerged aquatic vegetation, and early restoration projects would be monitored to assess the response of nonnative species to restoration designs and local environmental conditions. If indicated by monitoring results, the BDCP Implementation Office would implement invasive plant control measures in restored natural communities to help ensure the establishment of native marsh plain plant species. Additionally, the BDCP Implementation Office would actively remove submerged and floating aquatic vegetation in subtidal portions of tidal natural community restoration sites.

- *CM5 Seasonally Inundated Floodplain Restoration*: Floodplain restoration levee construction would result in the temporary disturbance of 1,323 acres along channels in the north, east, and south Delta (San Joaquin, Old, and Middle Rivers) that would provide opportunities for colonization by invasive plant species.
- *CM6 Channel Margin Enhancement*: Effects of channel margin enhancement were not analyzed separately from the effects of tidal habitat restoration. Channel margin enhancement (Sacramento River between Freeport and Walnut Grove, San Joaquin River between Vernalis and Mossdale, Steamboat and Sutter Sloughs, and salmonid migration channels in the interior Delta) would result in the temporary disturbance of channel areas that would provide opportunities for colonization by invasive plant species.
- *CM7 Riparian Natural Community Restoration*: The restoration of valley/foothill riparian habitat would result in the temporary disturbance of riparian areas that would provide opportunities for colonization by invasive plant species.
- *CM8 Grassland Natural Community Restoration*: The restoration of grassland habitat in CZs 1, 8, and/or 11 would result in the temporary disturbance of grassland areas that would provide opportunities for colonization by invasive plant species.
- *CM9 Vernal Pool and Alkali Seasonal Wetland Complex Restoration*: The restoration of vernal pool complexes in CZs 1, 8, or 11 would result in the temporary disturbance of grassland areas that would provide opportunities for colonization by invasive plant species.
- *CM10 Nontidal Marsh Restoration*: Nontidal marsh restoration, which would take place through conversion of agricultural lands in CZs 2 and 4, would result in the temporary disturbance of fallow agricultural areas that would provide opportunities for colonization by invasive plant species. These adverse effects would be reduced by monitoring the development of marsh vegetation to determine if nonnative vegetation needs to be controlled to facilitate the establishment of native marsh vegetation or if restoration success could be improved with supplemental plantings of native species. If indicated by monitoring, nonnative vegetation control measures and supplemental plantings would be implemented.
- *CM22 Avoidance and Minimization Measures: AMM6 Spoils, Tunnel Muck, and Dredged Material Disposal Plan* would have adverse effects if spoil, dredge, or chipped vegetative materials containing viable invasive plant propagules are used as topsoil in uninfested areas.

The adverse effects that would result from the introduction and spread of invasive plants through colonization of temporarily disturbed areas would be minimized by implementation of CM11, AMM4, AMM10, and AMM11.

- *CM11 Natural Communities Enhancement and Management* would reduce these adverse effects by implementing invasive plant control within the BDCP reserve system to reduce competition on native species, thereby improving conditions for covered species, ecosystem function, and native biodiversity. The invasive plant control efforts would target new infestations that are relatively easy to control or the most ecologically damaging nonnative plants for which effective suppression techniques are available. In aquatic and emergent wetland communities, perennial pepperweed, barbgrass, and rabbitsfoot grass would be controlled (and tidal mudflats would be maintained). In riparian areas, invasive plant control would focus on reducing or eliminating species such as Himalayan blackberry, giant reed, and perennial pepperweed. In grassland areas, techniques such as grazing and prescribed burning may be used to decrease the cover of invasive plant species.

Implementation of AMMs 4, 10, and 11 would also reduce the adverse effects that could result from construction activities. The AMMs provide methods to minimize ground disturbance, guidance for developing restoration and monitoring plans for temporary construction effects, and measures to minimize the introduction and spread of invasive plants. AMM4 would involve the preparation and implementation of an erosion and sediment control plan that would control erosion and sedimentation and restore soils and vegetation in affected areas. The restoration and monitoring plans for implementation of AMM10 would involve methods for stockpiling, storing, and restoring topsoil, revegetating disturbed areas, monitoring and maintenance schedules, adaptive management strategies, reporting requirements, and success criteria. AMM10 would also include planting native species appropriate for the natural community being restored, with the exception of some borrow sites in cultivated lands that would be restored as grasslands.

AMM11 specifies that the BDCP Implementation Office will retain a qualified botanist or weed scientist prior to clearing operations to determine if affected areas contain invasive plants. If areas to be cleared do contain invasive plants, then chipped vegetation material from those areas will not be used for erosion control but will be disposed ~~of~~ to minimize the spread of invasive plant propagules (e.g., burning, composting). During construction of the water conveyance facilities and construction activities associated with the other CMs, construction vehicles and construction machinery will be cleaned prior to entering construction sites that are in or adjacent natural communities other than cultivated lands and prior to entering any BDCP restoration sites or conservation lands other than cultivated lands. Vehicles working in or travelling off paved roads through areas with infestations of invasive plant species will be cleaned before travelling to other parts of the Plan Area. Cleaning stations will be established at the perimeter of BDCP covered activities along construction routes as well as at the entrance to reserve system lands. Biological monitoring will include locating and mapping locations of invasive plant species within the construction areas during the construction phase and the restoration phase. Infestations of invasive plant species will be targeted for control or eradication as part of the restoration and revegetation of temporarily disturbed construction areas.

The implementation of AMMs 4, 10, and 11 and CM11 would reduce the potential for the introduction and spread of invasive plants and avoid or minimize the potential adverse effects on natural communities and special-status species; therefore, these effects are not considered to be substantial.

CEQA Conclusion: Under Alternative 4, impacts on natural communities from the introduction or spread of invasive plants as a result of implementing the BDCP would not result in the long-term degradation of a sensitive natural community due to substantial alteration of site conditions and would, therefore, be considered less than significant. No mitigation would be required.

Water Transfers

Impact BIO-185: Effects of water transfers on terrestrial biological resources

Chapter 3, *Description of Alternatives,* includes a brief consideration of water transfers as a covered action for the BDCP. Water transfers are a common water management tool that is regulated by numerous codes and regulations, including the California Water Code, CEQA, and potentially NEPA. As stated in Chapter 3, the legal constraints that affect water transfers in the Sacramento and San Joaquin Valleys should prevent water transfers that would cause harm to the aquatic species, terrestrial species covered by the BDCP, noncovered terrestrial species, and common terrestrial species protected under the BDCP.

The principal effect of concern on terrestrial biological resources resulting from water transfers is the potential loss of habitat for special-status and common wildlife species due to reduction in agricultural crop production. There could be an associated effect related to reduced agricultural return flows in valley canals and streams. Transfers could temporarily reduce habitat and food sources for species that utilize cultivated lands in the Sacramento Valley. The major crops of concern would be rice, corn and alfalfa. These annual crops provide a significant source of food, resting and roosting habitat, and a prey base for many species, including wintering waterfowl and shorebirds, sandhill cranes, giant garter snakes, and raptors, including Swainson's hawk. Reductions in agricultural return flows could also affect waterfowl, giant garter snakes, and a variety of special-status and common mammals and birds that use valley canals and streams and their adjacent vegetation for foraging, resting, and cover. Recent documentation prepared by Reclamation and DWR of the potential effects associated with water transfers indicate that major transfers from the Sacramento Valley would primarily impact rice production (Bureau of Reclamation 2010; California Department of Water Resources and Bureau of Reclamation 2012). DWR has indicated that transfers would not be allowed if they resulted in a direct effect on pasture, mixed grasses, alfalfa grown in the Delta, orchards, and vineyards; DWR also would not allow transfers from farmland that is historically irrigated by groundwater (Bureau of Reclamation 2012; Appendix 12C, *2009 to 2011 Bay Delta Conservation Plan EIR/EIS Environmental Data Report*).

Although there is the potential for a reduction in rice production as a result of water transfers, it is speculative to estimate the effect at this time because there are no specific proposals to consider. The significance of this effect would be determined by the size, duration, and location of the reduced agricultural production, measures implemented to address any potential concerns, and the water seller's response to reduced water availability.

CEQA Conclusion: Alternative 4 could create surplus capacity in the Delta water delivery system that could facilitate additional water transfers. These transfers could result in a reduced amount of agricultural activity in the valley. Short-term transfers would be unlikely to result in a significant impact on the special-status and common wildlife species if these rice lands were placed back into production once the transfer was competed. Long-term transfers could have a more severe impact. The severity of the impact would be driven by the location, duration, and amount of the transfer. Because these details are unknown, it would be speculative to conclude that additional water transfers would result in a significant impact on terrestrial biological resources. Prior to approving water transfers DWR and Reclamation must evaluate the individual transfer for potential impacts to fish and wildlife resources. Many transfers require an initial review and approval by the SWRCB. Each transfer may also be subject to CEQA and/or NEPA review.

Compatibility with Plans and Policies

Impact BIO-186: Compatibility of the proposed water conveyance facilities and other conservation measures with federal, state, or local laws, plans, policies, or executive orders addressing terrestrial biological resources in the study area

Constructing the water conveyance facilities (CM1) and implementing CM2–CM22 for Alternative 4 have the potential for being incompatible with plans and policies related to managing and protecting terrestrial biological resources of the study area. A number of laws, plans, policies, programs, and executive orders that are relevant to actions in the study area provide guidance for terrestrial biological resource issues as overviewed in Section 12.2, *Regulatory Setting*. This overview of plan and policy compatibility evaluates whether Alternative 4 would be compatible or incompatible with such enactments, rather than whether impacts would be adverse or not adverse, or significant or less than significant. If the incompatibility relates to an applicable plan, policy, or executive order adopted to avoid or mitigate terrestrial biological resource effects, then an incompatibility might be indicative of a related significant or adverse effect under CEQA and NEPA, respectively. Such physical effects of Alternative 4 on terrestrial biological resources are addressed in Impacts BIO-1 through BIO-3. The following is a summary of compatibility evaluations related to terrestrial biological resources for laws, plans, policies, and executive orders relevant to the BDCP.

Federal and State Legislation

- The federal *Clean Water Act*, *Endangered Species Act*, *Fish and Wildlife Coordination Act*, *Migratory Bird Treaty Act*, *Rivers and Harbors Act* and *Marine Mammal Protection Act* all contain legal guidance that either directly or indirectly promotes or stipulates the protection and conservation of terrestrial biological resources in the process of undertaking activities that involve federal decisionmaking. The biological goals and objectives contained in the BDCP that provide the major guidance for implementing the various conservation elements of Alternative 4 are all designed to promote the long-term viability of the natural communities, special-status species, and common species that inhabit the Plan Area. While some of the conservation measures of the alternative involve permanent and temporary loss of natural communities and associated habitats during facilities construction and expansion of certain natural communities, the long-term guidance in the Plan would provide for the long-term viability and expansion of the habitats and special-status species populations in the Plan Area. Alternative 4 conservation actions would be compatible with the policies and directives for terrestrial biological resources contained in these federal laws.
- The *California Endangered Species Act*, *California Native Plant Protection Act*, *Porter-Cologne Water Quality Control Act*, and *Natural Communities Conservation Planning Act* are state laws that have relevance to the management and protection of terrestrial biological resources in the study area. Each of these laws promotes consideration of wildlife and native vegetation either through comprehensive planning or through regulation of activities that may have an adverse effect on the terrestrial and aquatic natural resources of the state. The BDCP, which is the basis for Alternative 4, contains biological goals and objectives that have been developed to promote the species protection and natural resource conservation that are directed by these state laws. Alternative 4 conservation actions would be compatible with the policies and directives contained in these laws.
- The *Johnston-Baker-Andal-Boatwright Delta Protection Act of 1992* (*Delta Protection Act*) and the *Sacramento-San Joaquin Delta Reform Act*, which updated the Delta Protection Act, promote the

maintenance and protection of natural resources and the protection of agricultural land uses in the Delta's primary zone through the goals and policies contained in the 2009 updated Land Use and Resources Management Plan (LURMP). While nothing in the LURMP is binding on state agencies that are BDCP proponents, the LURMP does promote restoration and enhancement of habitats for the terrestrial and aquatic species of the Delta on public land. The BDCP biological goals and objectives would be compatible with these LURMP goals (Delta Protection Commission 2009).

- The *Suisun Marsh Preservation Act* of 1974 was designed to protect the Suisun Marsh for long-term use as wildlife habitat, with a goal of preserving and enhancing the quality and diversity of the Marsh's aquatic and wildlife habitats. The BDCP and its plans for protection and restoration of tidal marsh habitats in Suisun Marsh would be compatible with the intent of the Suisun Marsh Preservation Act.

Plans, Programs, and Policies

- *The Delta Plan*, which is being developed by the Delta Stewardship Council in compliance with the 2009 Sacramento-San Joaquin Delta Reform Act, is mandated to achieve two co-equal goals: provide for a more reliable water supply for California and protect, restore, and enhance the Delta ecosystem. The co-equal goals are to be achieved in a manner that protects and enhances the unique cultural, recreational, natural resource, and agricultural values of the Delta as an evolving place. The BDCP is intended to become a component of the Delta Plan. The Delta Stewardship Council will determine whether the BDCP is compatible with the goals and objectives of the Delta Plan prior to its incorporation into the Plan. The compatibility of the BDCP with the Delta Plan is considered in detail in Section 13.2.2.2 of Chapter 13, *Land Use*.
- *California Wetlands Conservation Policy*, which was adopted by Executive Order in 1993, promotes a long-term gain in the quantity, quality and permanence of wetlands acreages and values in California. The BDCP conservation measures that provide for a significant expansion of wetland acreage and quality in the Delta and Suisun Marsh are compatible with the intent of the California Wetlands Conservation Policy.
- *The North American Waterfowl Management Plan* (*NAWMP*) and *Central Valley Joint Venture* (*CVJV*) strive to maintain and expand wetlands and uplands for waterfowl and shorebirds in the major basins of California's Central Valley. The NAWMP is a management plan jointly approved by the United States and Canada in 1986. It contains general guidance from the principal wildlife management agencies of the two countries for sustaining abundant waterfowl populations by conserving landscapes through self-directed partnerships (joint ventures) that are guided by sound science. The CVJV is the joint venture established for overseeing NAWMP implementation in the Central Valley. The CVJV is made up of 21 conservation organizations, state and federal government agencies, and one corporation that have formed a partnership to improve the habitat conditions for breeding and non-breeding waterfowl, breeding and non-breeding shorebirds, waterbirds, and riparian-dependent songbirds in the Central Valley. The CVJV's 2006 Implementation Plan (Central Valley Joint Venture 2006) establishes conservation objectives and priorities for these bird groups within the basins of the Central Valley. The BDCP Plan Area includes all or portions of three Implementation Plan basins— the Delta, Yolo and Suisun basins. The 2006 Implementation Plan contains basin-specific objectives for wetland restoration, protection of existing wetland habitats, wetland enhancement, adequate power and water supplies for wetland management, agricultural land enhancement, farmland easements that

maintain waterfowl food resources on agricultural land, and farmland easements that buffer existing wetlands from urban and residential growth.

Implementation of the Alternative 4 conservation measures would result in significant reductions in cultivated land and managed wetland acreage in the Delta, Yolo and Suisun basins; however, significant increases in tidal and nontidal wetlands in these basins would be another result. Because of the large conversion of managed wetland in the Suisun basin, the BDCP has included a large managed wetland conservation and enhancement goal for this area. For the Suisun basin conversions to be compatible with the 2006 Implementation Plan goals, this EIR/EIS has added mitigation that would require food production studies and adaptive management to ensure that the Suisun basin would continue to provide the waterfowl and shorebird habitat envisioned in the Implementation Plan.

- *Stone Lakes National Wildlife Refuge Comprehensive Conservation Plan*, *Cosumnes River Preserve Management Plan*, *Brannan Island and Franks Tract State Recreation Areas General Plan*, *Yolo Bypass Wildlife Area Land Management Plan*, *Grizzly Island Wildlife Area Management Plan*, and the *Lower Sherman Island Wildlife Area Land Management Plan* are primarily designed to preserve and enhance the natural resource and recreation qualities of these areas. Implementing Alternative 4, especially construction of CM1 and CM2 facilities, and land modification associated with CM4 restoration activities, could create temporary disruptions to the terrestrial biological resource management activities in these management areas. The ultimate goals of aquatic and terrestrial habitat enhancement and restoration contained in the BDCP would be compatible with the long-term management goals of these areas. Proposed restoration areas in the Yolo Bypass, on Sherman Island, and in Suisun Marsh would be designed to be compatible with and to complement the current management direction for these areas and would be required to adapt restoration proposals to meet current policy established for managing these areas.
- *Suisun Marsh Preservation Agreement* and *Suisun Marsh Plan* are the most recent efforts by the state and federal agencies responsible for Suisun Marsh (the Marsh) to maintain its long-term viability as managed wetlands and wildlife habitat, consistent with the Suisun Marsh Preservation Act. The Suisun Marsh Preservation Agreement (SMPA) was signed in 1987 and modified in 2005 by DWR, CDFW, Reclamation and the Suisun Resource Conservation District to establish the mitigation approach in the Marsh for effects of operating the SWP and CVP. The primary concerns were the effects of CVP and SWP Delta diversions on salinity in the Marsh. The SMPA focused on ways to ensure adequate water quality and quantity for the managed wetlands and wildlife habitats in the Marsh to assure equal waterfowl values in the Marsh. The Suisun Marsh Plan (SMP), for which a Final EIS/EIR was released in 2010 by these agencies, provides for restoration of tidal marsh habitat and enhancement of managed wetland in the Marsh, maintenance of waterfowl hunting and recreational opportunities in the Marsh, maintenance and improvement of the Marsh levee system, and protection and enhancement of water quality for beneficial uses of the Marsh. An integral component of the SMP is balancing continued managed wetland operation with new tidal wetland restoration to provide improved and greater habitat for fish and wildlife species. The SMP is a programmatic, long-term plan and does not include specific projects, project proponents, or funding mechanisms. However, the SMP relies on tidal restoration to allow for managed wetland operations to continue. The BDCP would provide a funding mechanism and increased management potential relative to existing and restored habitats, assisting the SMP in meeting its broader ecological goals, consistent with long-term operation of the SWP and CVP water conveyance facilities. The conservation actions

contained in the BDCP, which are designed to ensure the long-term protection and recovery of special-status fish and wildlife species dependent on the Marsh, would be compatible with the water quality and habitat restoration goals of the SMPA and SMP.

- *California Aquatic Invasive Species Management Plan* does not address terrestrial invasive species. Implementation of the Plan's long-term control and management objectives affect terrestrial species that utilize study area aquatic habitats. These effects are positive in that Plan objectives are to control and remove invasive aquatic species that are detrimental to native aquatic and terrestrial species. Implementation of BDCP's conservation actions would be undertaken with the goal of avoiding any further spread of aquatic invasive species. Alternative 4 would, therefore, be compatible with the objectives of the California Aquatic Invasive Species Management Plan.
- *Habitat Conservation Plans and Natural Community Conservation Plans* are the subject of a detailed analysis at the end of this chapter. The analysis considers the compatibility of the BDCP with all HCPs and NCCPs that share planning area with the BDCP Plan Area.

Executive Orders

- *Executive Order 11990: Protection of Wetlands* requires all federal agencies to consider wetland protection in their policies and actions. The BDCP proposes to protect, enhance and expand the wetlands of the Plan Area, and, therefore, would be compatible with Executive Order 11990.
- *Executive Order 13112: Invasive Species* directs federal agencies to prevent and control the introduction and spread of invasive species in a cost-effective and environmentally sound manner. Alternative 4 construction and restoration actions have the potential to both introduce and spread invasive species in the study area. Implementation of mitigation measures described in this chapter would be capable of making Alternative 4 implementation compatible with Executive Order 13112.
- *Executive Order 113443: Facilitation of Hunting Heritage and Wildlife Conservation* directs federal agencies whose activities affect public land management, outdoor recreation, and wildlife management to facilitate the expansion and enhancement of hunting opportunities, and the management of game species and their habitat. Alternative 4 conservation measures that involve conversion of cultivated land and managed wetland to tidal and nontidal wetlands and other natural communities would conflict with the hunting expansion and enhancement aspects of this executive order. Refer to Chapter 15, *Recreation*, for a detailed analysis of the effects of alternatives on hunting opportunities. The habitat protection and expansion conservation measures of Alternative 4 would be compatible with the executive order's goal of facilitating the management of habitats for some game species.

CEQA Conclusion: The potential plan and policy incompatibilities of implementing Alternative 4 identified in the analysis above indicate the potential for a physical consequence to the environment. The primary physical consequence of concern is the conversion of large acreages of cultivated land and managed wetland to natural wetland and riparian habitat in the study area. The physical effects are discussed in the Shorebirds and Waterfowl analysis above and no additional CEQA conclusion is required related to the compatibility of the alternative with relevant plans and polices.